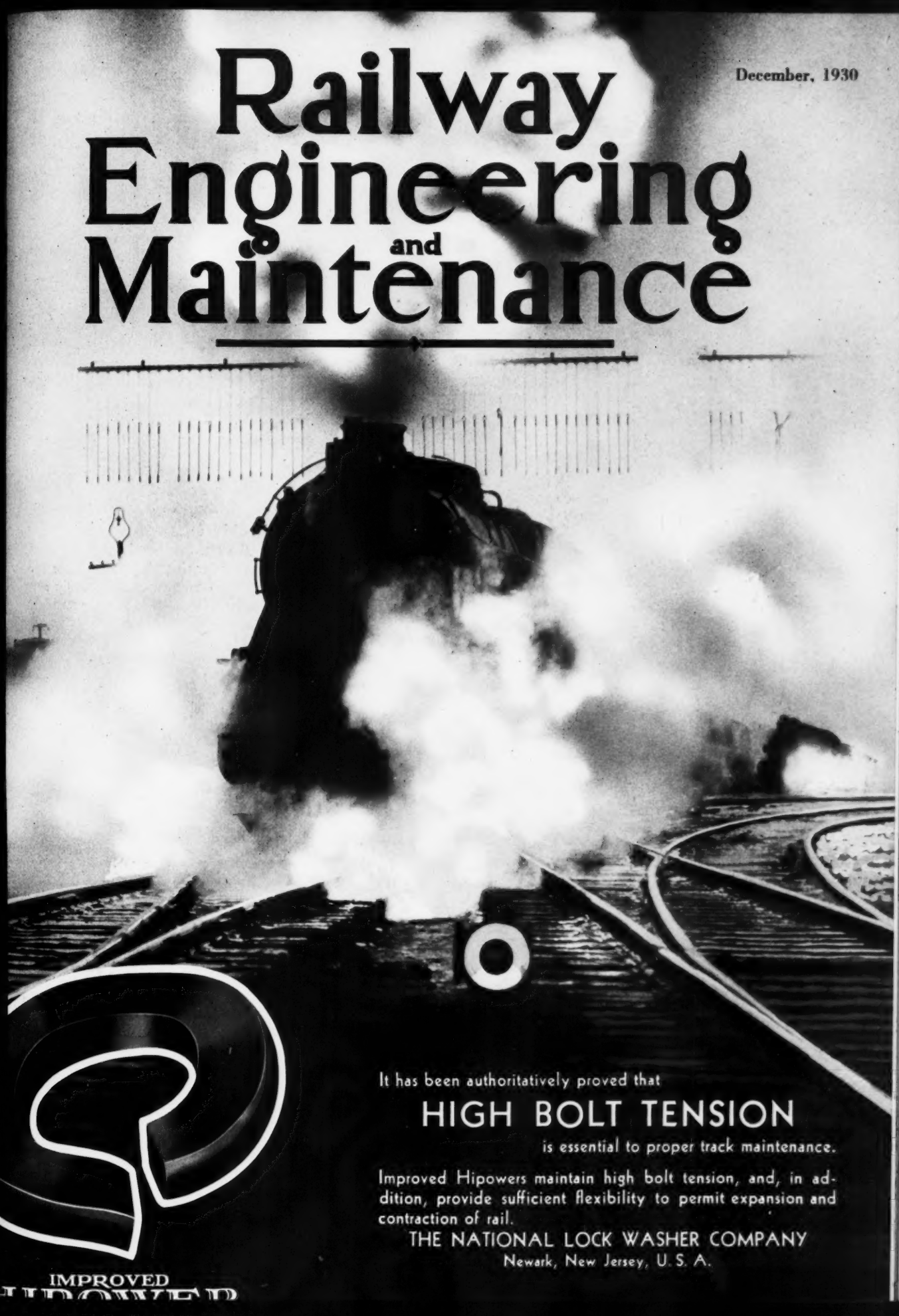
December, 1930

Railway Engineering and Maintenance



RAILWAY ENGINEERING AND MAINTENANCE
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Alphabetical Index to Advertisers, Page 60 Classified Index to Advertisers, 56-58

A Ton of Lundie Plates
Weighs No More Than
A Ton of Any Other Plates

But—

Their Design Makes Lundie Protected Ties Last Longer

THE Lundie Plate is more than so many pounds of metal. It is an economic device, based on an unusual design, that performs a definite service economically.

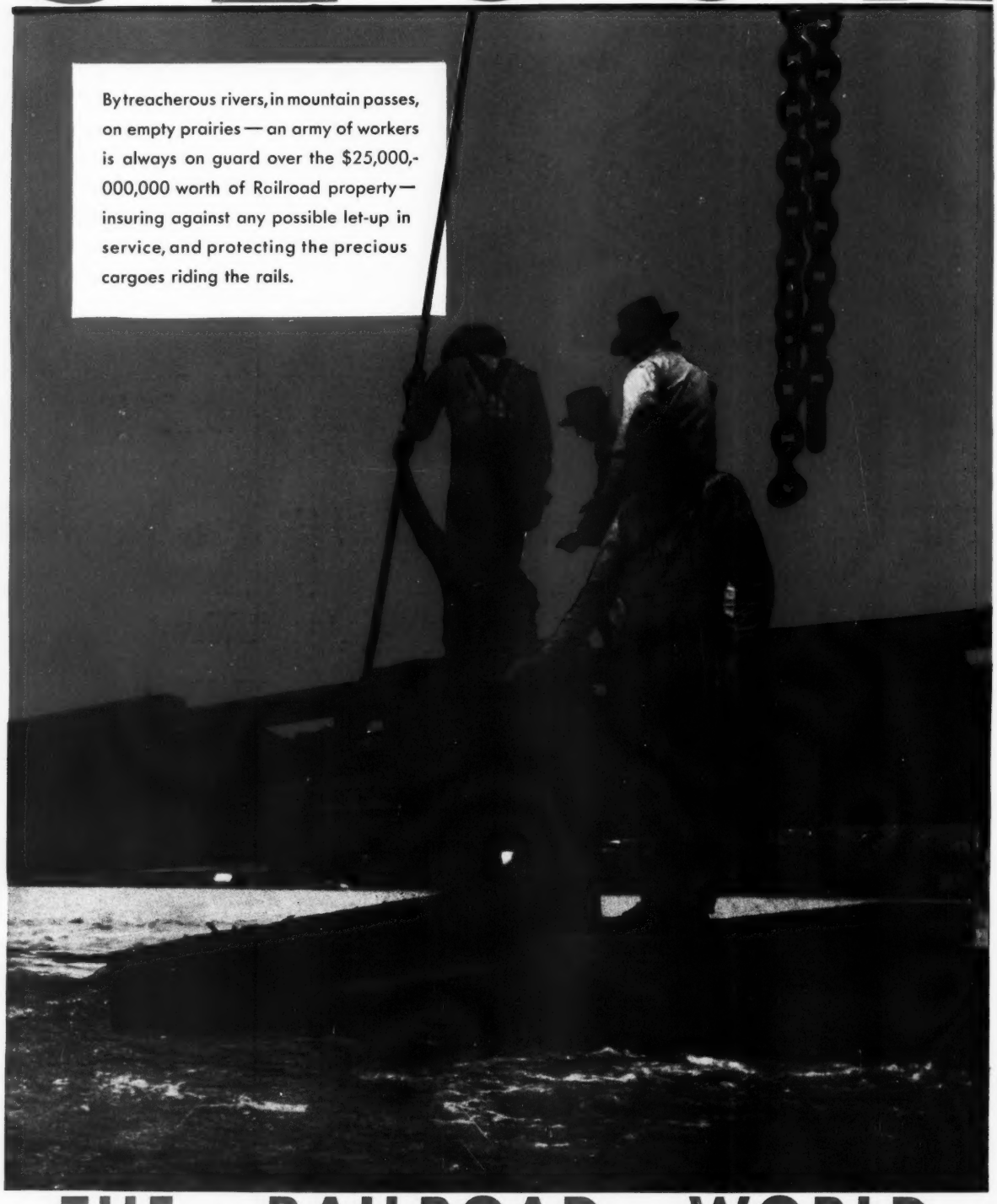
This canted bottom tie plate, with its rounded steps, holds track to gauge, and most important of all, accomplishes this without injuring a single fibre of the tie.

The total absence of destructive projections prevents cutting and mechanical wear thereby insuring maximum tie life and return on cross tie investment.

The Lundie Engineering Corporation
285 Madison Avenue, New York
59 East Van Buren Street, Chicago

LUNDIE TIE PLATE

SECUR



• THE • RAILROAD • WORLD •

ITY . . . .

While no price is too high to pay for security, the gigantic scale upon which the Railroad World operates demands that the cost be reasonable as possible. Every tool, every product used on maintenance work is carefully checked in service as to efficiency, dependability and cost of operation. No claims or guesses count—only facts and figures. The Railroad World KNOWS!

And the Railroad World KNOWS Fairmont Equipment—knows it to represent ***Lowest Overall Cost.*** That is proved by the fact that ***over half of all the motor cars now in use are Fairmont products!*** Few, if any, products used in maintenance work bear such an endorsement.

And as long as Railroads are operated on figures, the great majority of Motor Cars riding the rails will bear the Fairmont shield.

FAIRMONT RAILWAY MOTORS, INC.

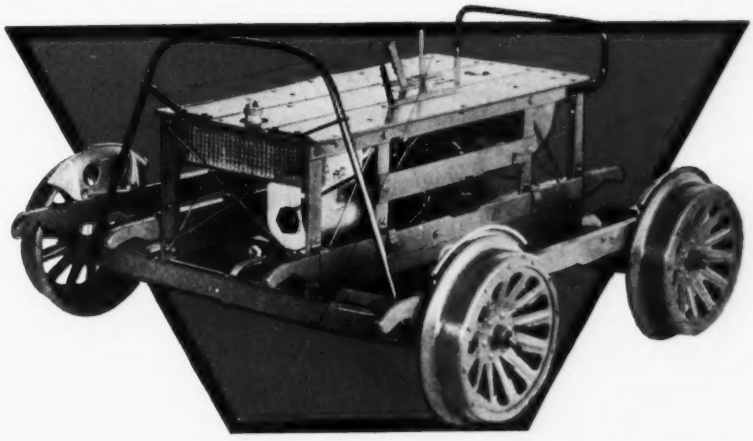
FAIRMONT, MINNESOTA, U. S. A.

General Sales Offices: 1356 Railway Exchange Bldg., CHICAGO

District Sales Offices: New York City Washington, D. C. St. Louis San Francisco New Orleans

FAIRMONT RAILWAY MOTORS, Ltd., Toronto, Canada *Foreign Representative:* BALDWIN LOCOMOTIVE WORKS

Manufacturers of section motor cars, inspection motor cars, gang and power cars, weed burners, ballast discers, ball and roller bearing engines, push cars and trailers, roller axle bearings, wheels, axles, and safety appliances



M19 Spring Mounted Inspection Car

This car is very popular with linemen and signalmen. Handles four boxes of battery renewals, two 10-gallon cans of water and two men—or, the car comfortably seats four men. Other inspection models include: C1—air cooled for one or two men, and MM9—water cooled for one or two men. Complete details at your request.

Fairmont Mudge

Performance on the Job Counts

• KNOWS • FAIRMONT •

2% of the crawler shovels, cranes and draglines on the Railways of America are NORTHWESTS!

There could not be a better testimonial to the value of Northwest features!

Northwest Engineering Co.

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines.

1713 Steger Building
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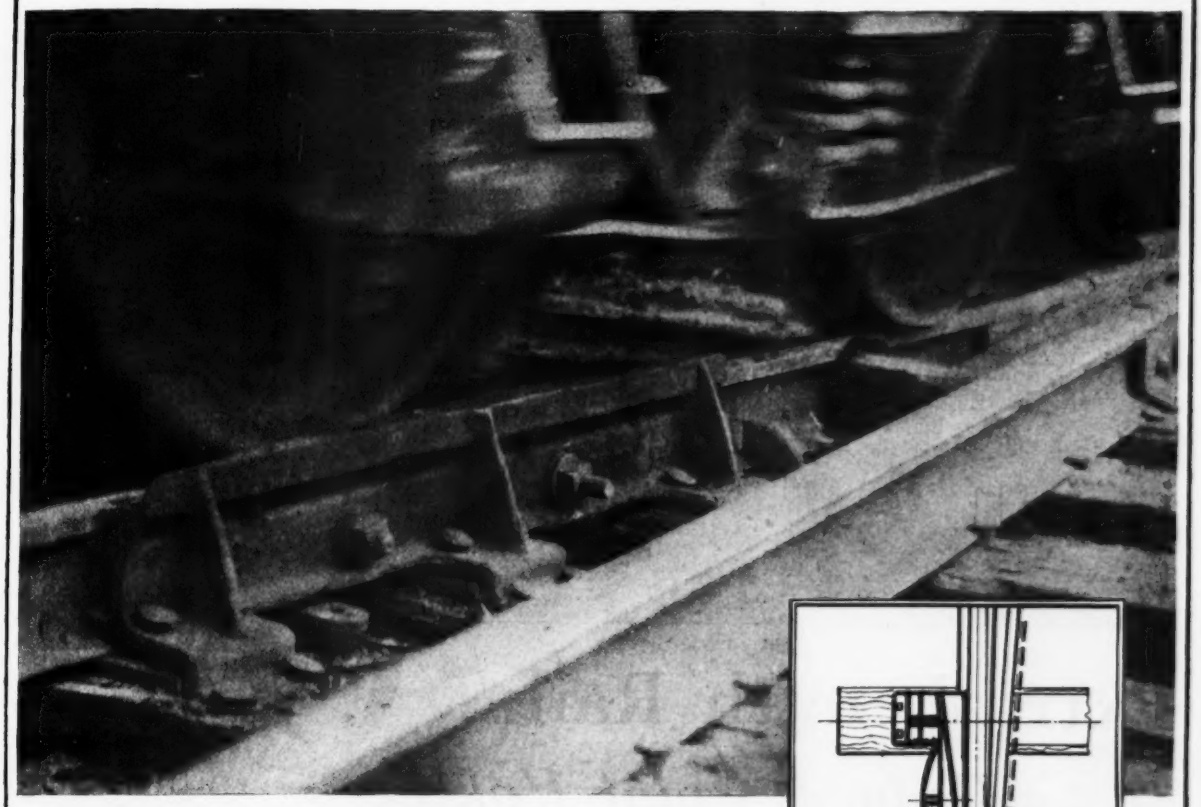
Chicago, Illinois, U. S. A.

RE&M 12 Gray

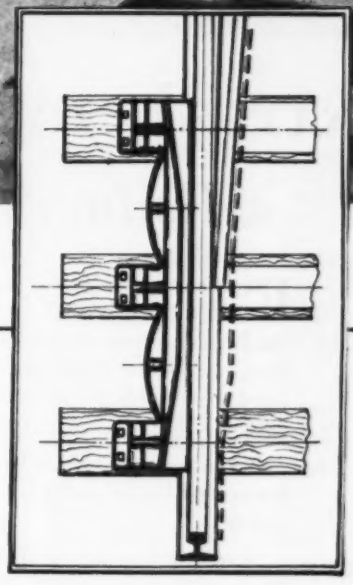
The standard by which shovels and cranes are measured

NORTHWEST

The Q & C Switch Point Guard



Untouched photograph showing a typical installation of a Q & C Switch Point Guard engaging the wheels ahead of the switch point



Line drawing of a three-tie installation showing the course taken by the wheels (dotted line) engaging the guard. The long angle of deflection reduces the shock between the track and rolling stock to a minimun.

Reducing Switch Point Renewals to a Minimum

The excessive wear on switch points from "crowding wheels" can be reduced to a minimum by using the Q & C Switch Point Guard. Made of full manganese steel and properly reinforced, this guard will prolong the life of the point many times.

The double angle of deflection (see diagram) gives protection to the switch point in either a facing point or trailing movement. They are designed to fit special switch plate conditions.

We will be glad to furnish full information and blue prints to engineers interested.

The Q & C Company, 90 West Street, New York

CHICAGO SAN FRANCISCO ST. LOUIS

OXWELD RAILROAD SERVICE

Extra-Length Rail

Reduces Joint Upkeep

EUROPEAN railways are demonstrating the practicability of extra-length rail under widely varying climatic conditions. On British roads, forty-five and sixty foot rails are standard lengths. German State Railways regularly use thirty meter rail, and have used welded lengths from 300 to 1000 feet on main tracks and welded 4000 ft. lengths for yard track, with satisfactory results.

Extra-length rail, whether welded or mill-made, lowers maintenance-of-way costs by reducing the number of joints requiring upkeep.

Many American railroads are double-lengthing their standard 39 and 33-ft. rail by oxwelding, especially at highway crossings, station platforms, ash pits, and yards. Oxwelding main line track insures stronger, better joints than can be obtained mechanically.

The Oxweld Railroad Service Company, for eighteen years experts in railroad welding, stands ready to assist American railroads in developing oxwelded extra-length track. Oxweld engineers will train your employees, supervise their work, and provide the best facilities and supplies for economical, efficient operation.

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK
Carbide and Carbon Bldg.

UCC

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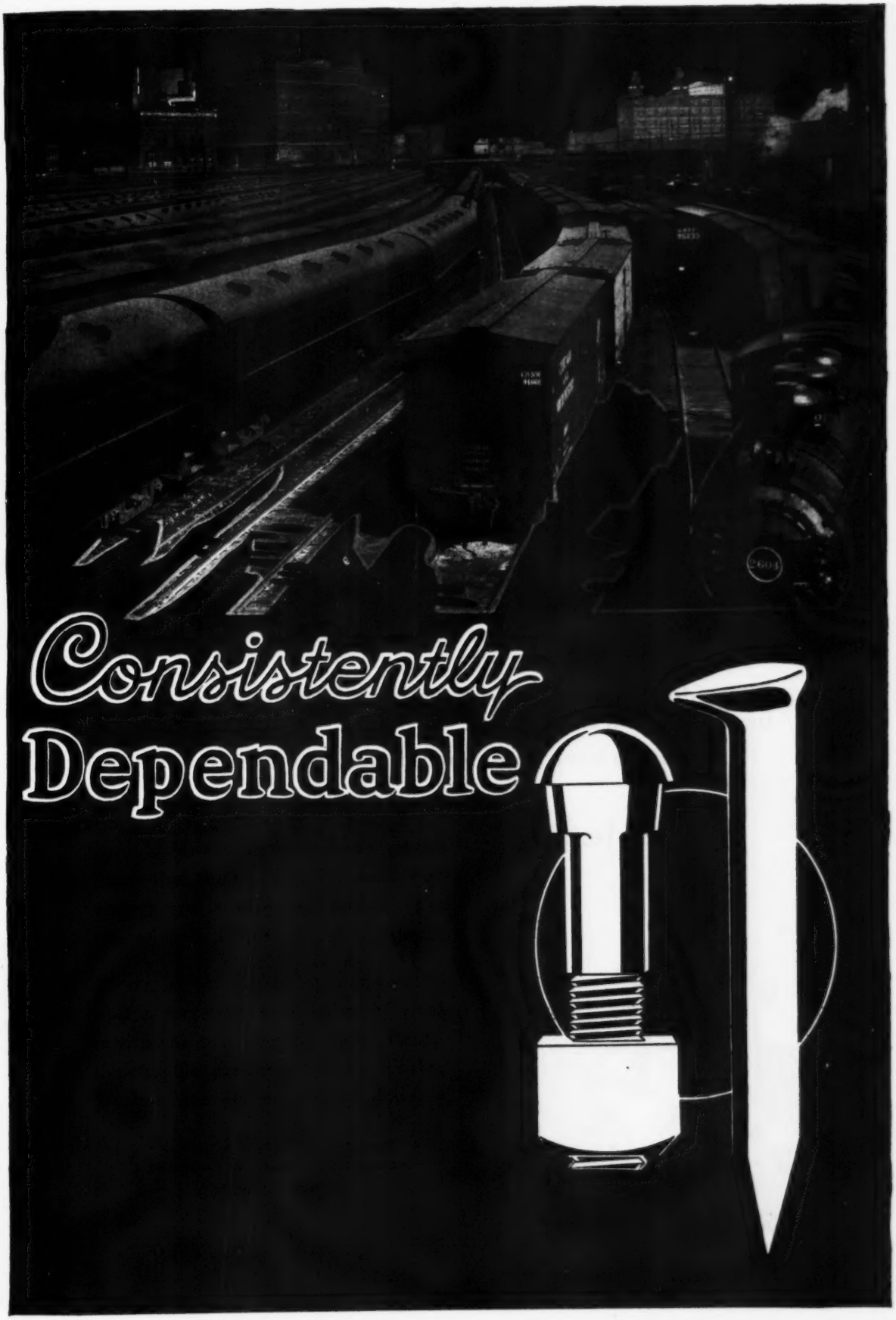
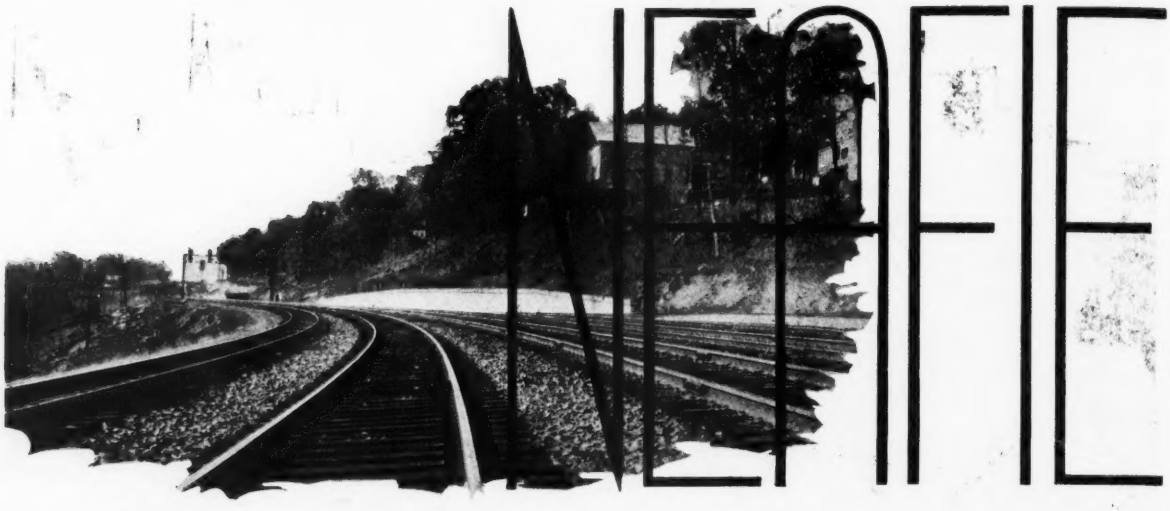
Carbide and Carbon Bldg.


Consistently
Dependable



A Proved American Track Construction

IN these days of heavy traffic and high speeds, maintenance costs are more than ever an item of serious consideration.

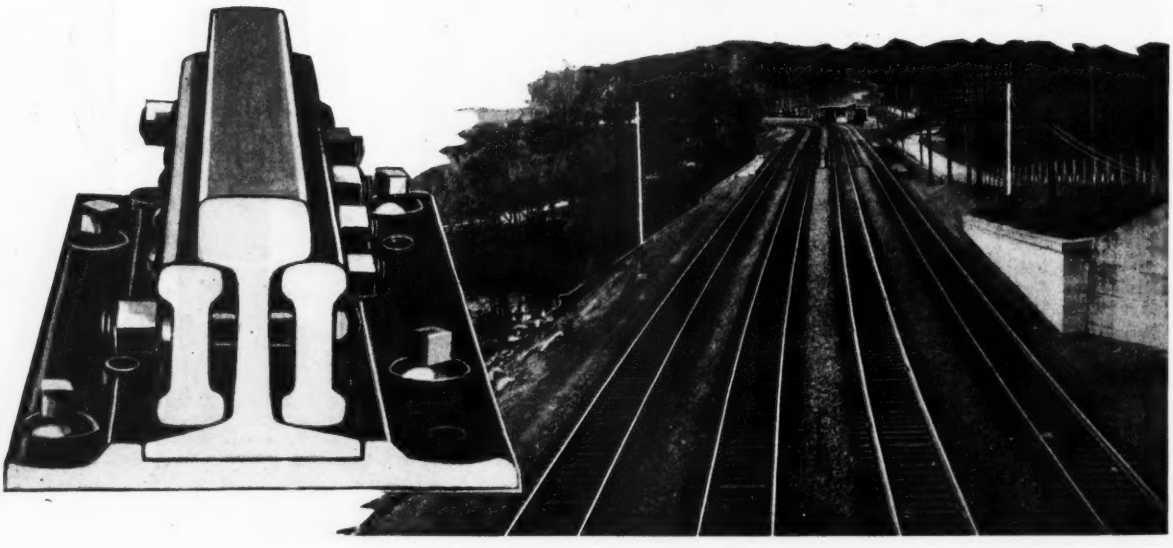
The Neafie Rail Joint with its heavy broad base plate constitutes a great stride toward permanent track construction and therefore an active agency of economy and at nominal cost.

In addition to its characteristics of permanence, it is a tie saver and a labor saver.

These facts have been demonstrated over the past eight years.

THE RAIL JOINT COMPANY

165 Broadway—New York



FAIRBANKS-MORSE ANNOUNCE

The Light Weight, One-Man Inspection Car

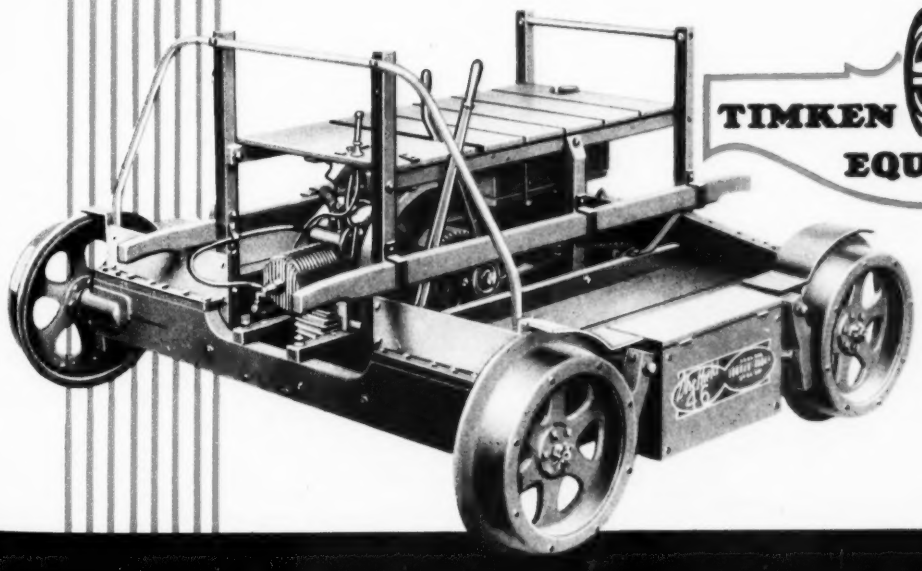
TOTAL WEIGHT LESS THAN 400 LBS. LIFTING WEIGHT, WITH HANDLES EXTENDED, ONLY 100 LBS.

Easy to handle. Economical to operate. Strong enough to withstand heavy service conditions. These are the qualities you have wanted in your inspection cars. Now you can get them all in this remarkable new car announced by Fairbanks-Morse.

"Sheffield" No. 46 MOTOR CAR

The Sheffield No. 46 marks another distinct advance in motor car design and construction. It is the first *real* solution of the one-man car problem.

(*continued on next page*)



TIMKEN BEARING EQUIPPED

FAIRBANKS-MORSE

MOTOR CARS

POWER, PUMPING AND WEIGHING EQUIPMENT

TIMKEN BEARING EQUIPPED

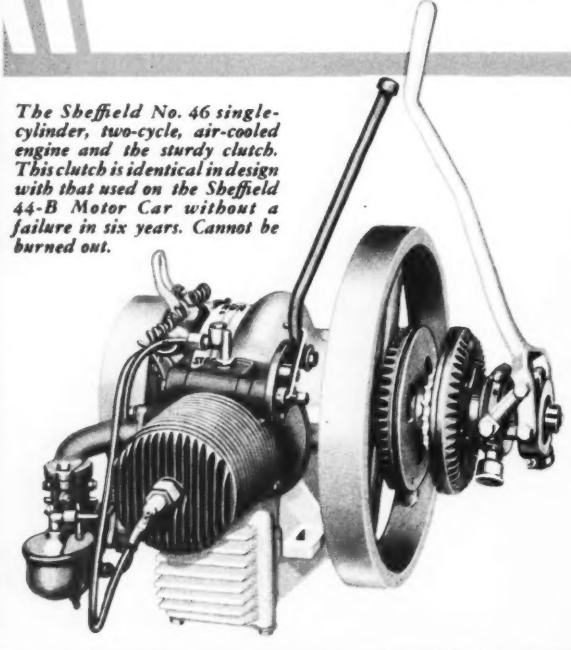
(continued from preceding page)

Light weight has been secured without sacrifice of strength, long life or power. It has been accomplished through the liberal use of heat-treated aluminum alloys—as strong as steel with only one-third the weight.

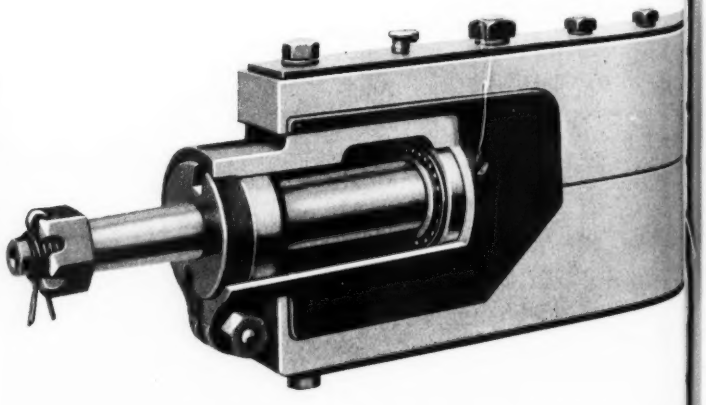
Ample strength is provided for all service conditions as well as room for all equipment. While the Sheffield No. 46 is designed as a one-man car, it will accommodate two men very comfortably. Simple operation—smooth running qualities—true safety-type body—all combine to form a car that is everything a one-man car *should* be.

Write today for complete details about the Sheffield No. 46 motor car. It is the result of four years of development and ten months of actual service under every operating condition to be found on American railroads.

FAIRBANKS-MORSE & CO.
900 S. Wabash Ave., Chicago
32 branches at your service throughout the United States

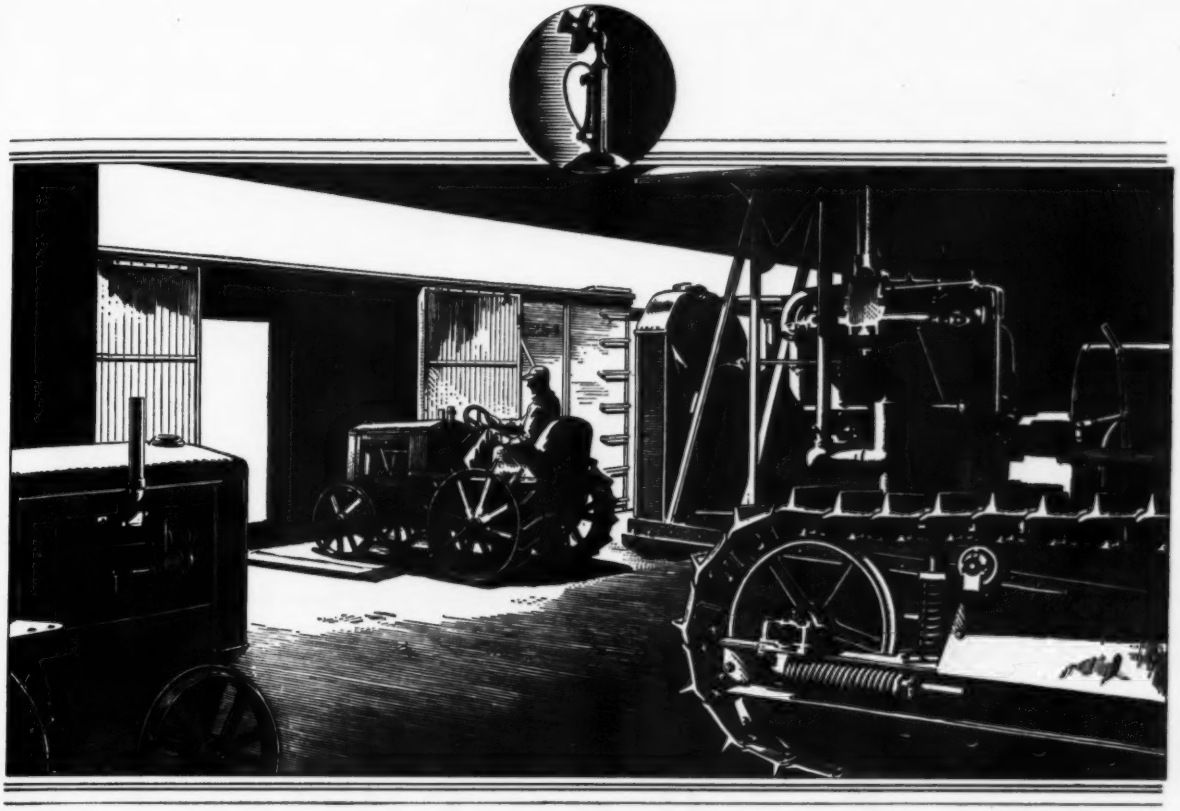


The Sheffield No. 46 single-cylinder, two-cycle, air-cooled engine and the sturdy clutch. This clutch is identical in design with that used on the Sheffield 44-B Motor Car without a failure in six years. Cannot be burned out.



Front sill of the Sheffield No. 46 Motor Car showing fabricated front axle. Axle and bearing housing are sectioned to show the Timken bearings. All four wheels are interchangeable.

FAIRBANKS-MORSE
MOTOR CARS
POWER, PUMPING AND WEIGHING EQUIPMENT



Business was Quiet... but the Telephone brought $22,200 in New Orders

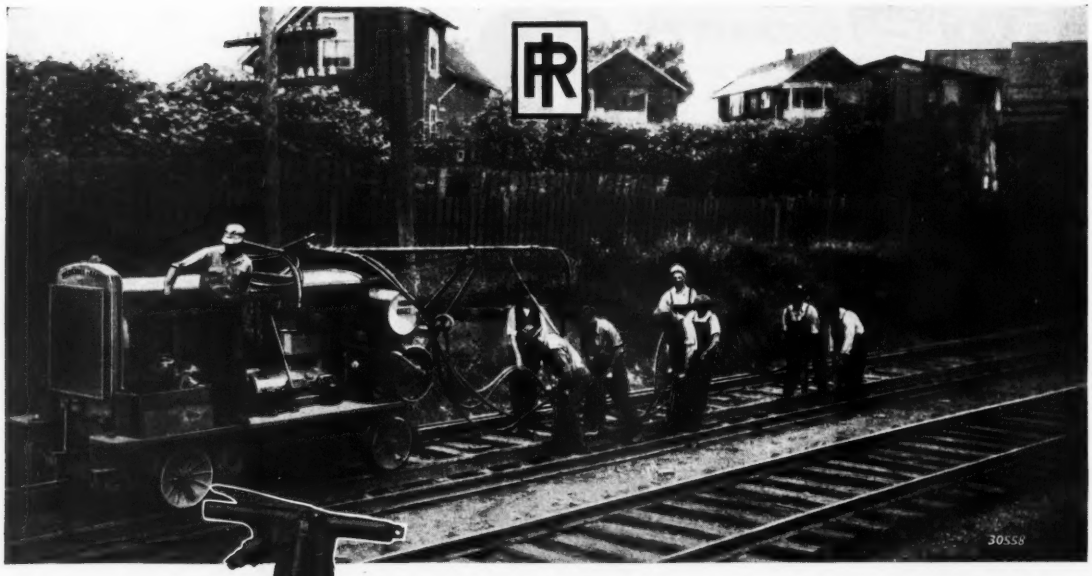
A TRACTOR company's sales had fallen off to a marked degree. A telephone sales program to distant customers was decided upon. One result was $18,400 worth of business. Another, a $3800 order after the purchaser had refused a personal interview.

An Eastern lumber company regularly "visits" lumber yards in five states by telephone. In one month 550 carloads of lumber totaling nearly $500,000 were sold by this modern method. Toll bills averaged less than one-half of one per cent.

Business firms, large and small, are using out-of-town telephone service more than ever to increase sales . . . reduce distribution costs . . . meet competition. New markets are developed at little expense. Customers and prospects are economically contacted between salesmen's visits.

Develop your business by telephone. Best results are obtained by having a definite plan for executives and salesmen to follow. Your local Bell Telephone Business Office will gladly submit a plan to meet your needs.

Inter-city calls are cheap, definite, resultful. Typical station-to-station day rates: Pittsburgh to Indianapolis, $1.50. Boston to Atlanta, $3.50. New York to Baltimore, 90c. Philadelphia to Seattle, $8.50. Bell Telephone service is *Quick . . . Convenient . . . Universal.*



Spike Drivers operated from I-R Tie Tamper Compressor

Size CC-250
Spike Driver

For Faster and Better Spiking—

One railroad that is using I-R Pneumatic Spike Drivers reports as follows:

"We started spiking at 9 A. M., and in the next three hours averaged 840 spikes per hour per tool, or 14 a minute. Two men alternated on each spike driver (one man working and the other carrying hose)."

In addition to fast work with I-R Spike Drivers, many railroad men claim these other advantages: (1) better holding power of the spikes because of even and rapid driving; (2) ties drawn up better to rail; (3) fewer broken or bent spikes, and (4) less fatigue to the workman.

Ingersoll-Rand labor-aiding track tools for rail laying operations include:

Spike Drivers
Rail Drills
Track Wrenches
Bonding Drills
Spike Pullers
Wood Borers
Tie Tampers
and
Compressors

INGERSOLL-RAND CO., 11 Broadway, New York City

Branches or distributors in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited,
10 Phillips Square, Montreal, Quebec

284-TT

Ingersoll-Rand

Bethlehem Hook Flange Guard Rails installed in passenger terminal.

High Speed with Safety

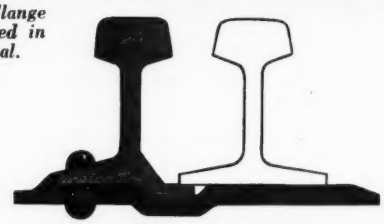
The higher speeds of passenger and freight trains has raised the performance requirements of guard rails. Bethlehem Hook-Flange Guard Rails are daily demonstrating their worth at high-speed locations. These guard rails are designed to provide the utmost safety at speeds as high as 100 miles per hour. They are suitable not only for traffic conditions of today but will continue to meet the requirements of the heavier and faster traffic that tomorrow is certain to bring.

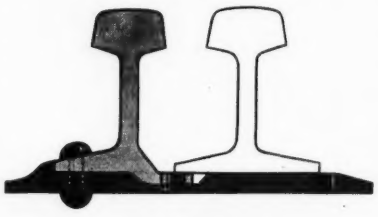
Bethlehem Hook-Flange Guard Rails have proved their economy, due to the inherent strength, endurance and wearing qualities which are built into them. There is a certain amount of resilience in the Bethlehem Hook-Flange Guard Rail that permits wheel flanges to slide through easily without the shock to guard and wheels that is usually experienced with rigid, cast steel, guard rails. This resilience prolongs the life of the guard rail and makes it safe.

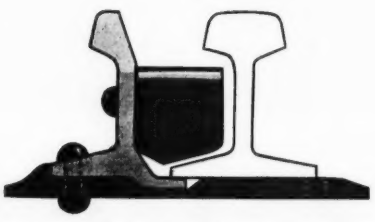
The Bethlehem Hook-Flange Guard Rail is made in one piece, of rolled steel, and requires no extra fittings of any kind. It is rolled with a depressed flange which, throughout its length, hooks under the main rail, positively preventing the guard rail from rising or overturning.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.
Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.
Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.







The above sectional views show the position of the Bethlehem Hook-Flange Guard Rail in relation to the stock rail.

BETHLEHEM

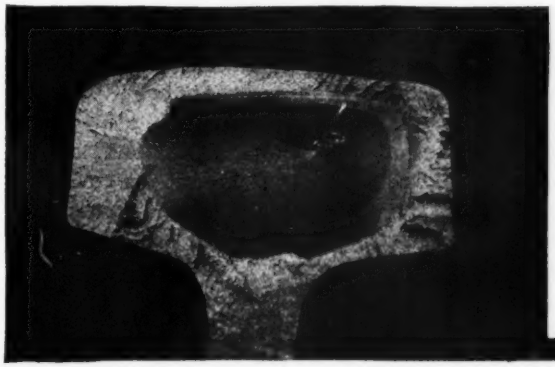
PERFECT RAILS—*Apparently...*

FROM the rear of a Sperry Detector Car the operator, sitting at his post, watches the track being tested. In front of him a paper strip, passing under recording pens, moves over the table. To his right a control panel gives complete control of testing conditions. The rails in view, from all external appearances, are apparently perfect.

But—The Sperry Detector Car marked this one *Defective...*

At a spot in the rail where no outward indication of a flaw was visible, the recording pens indicated a hidden defect. Simultaneously an automatically operated paint gun marked the rail. The exact location of the defect was established on the record. The paint mark facilitates locating the rail.

This completely hidden fissure—50% of rail head —was *Found...*



To confirm the defect predicted, this rail was broken. A 50% fissure was found that weakened the rail and made it dangerous to safe transportation. The Sperry Detector Car by causing the removal of such rails reduces the possibilities of derailment and eliminates resulting expensive repairs to right-of-way.

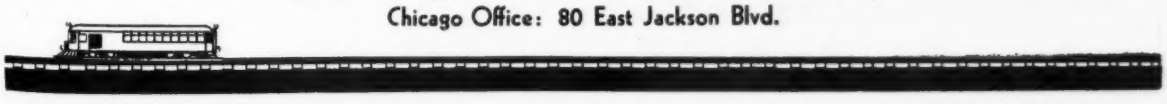
SPERRY PRODUCTS INC.

SPERRY RAIL SERVICE

SPERRY PRODUCTS, INC.

Sperry Building, Manhattan Bridge Plaza, Brooklyn, N. Y.

Chicago Office: 80 East Jackson Blvd.



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ADDRESS REPLY TO
105 WEST ADAMS ST,
CHICAGO, ILL.

Subject: All in a Day's Work

Dear Reader: November 27, 1930
Everywhere

A few days ago a local newspaper in a small town in California issued a special edition to celebrate the completion of a bridge in that vicinity. Papers in adjacent cities gave a few inches of space to the project, while beyond a radius of a few hundred miles the occasion passed unnoticed.

Yet this structure is one of the outstanding railroad bridges of the country. It crosses a waterway that it has long been considered impractical to bridge, and replaces ferries that have been in continuous operation for more than 50 years. It involves piers extending more than 130 ft. below the surface of the water and rising to a total height of 207 ft. above bed rock. These piers support a structure more than 5,600 ft. in length with individual spans 526 ft. long.

This structure, which represents an expenditure of more than $12,000,000 and was completed within a period of 18 months, is the Martinez-Benicia bridge of the Southern Pacific across Suisun Bay between Sacramento, Cal., and Oakland.

Although trains of the Overland and Shasta routes have been crossing this structure only since October, it will only be a few weeks or months until it will be of so little interest to the casual traveler that he will scarcely glance up from his book to observe that he is crossing "another bridge."

Such is the attention accorded one of America's great railway structures, a bridge whose construction record reflects credit on every railway man. The pity of it is that those who, through brain and brawn, conceived, planned and built this structure, will soon be forgotten by the public, which takes such contributions to its comfort as a matter of course. Yet, year in and year out, men in railway service are striving to make travel more rapid, more comfortable and more safe, with a little thought of recognition from the public. To them it is all in a day's work.

Yours very truly,

Elmer T. Howson

ETH*MM Editor.

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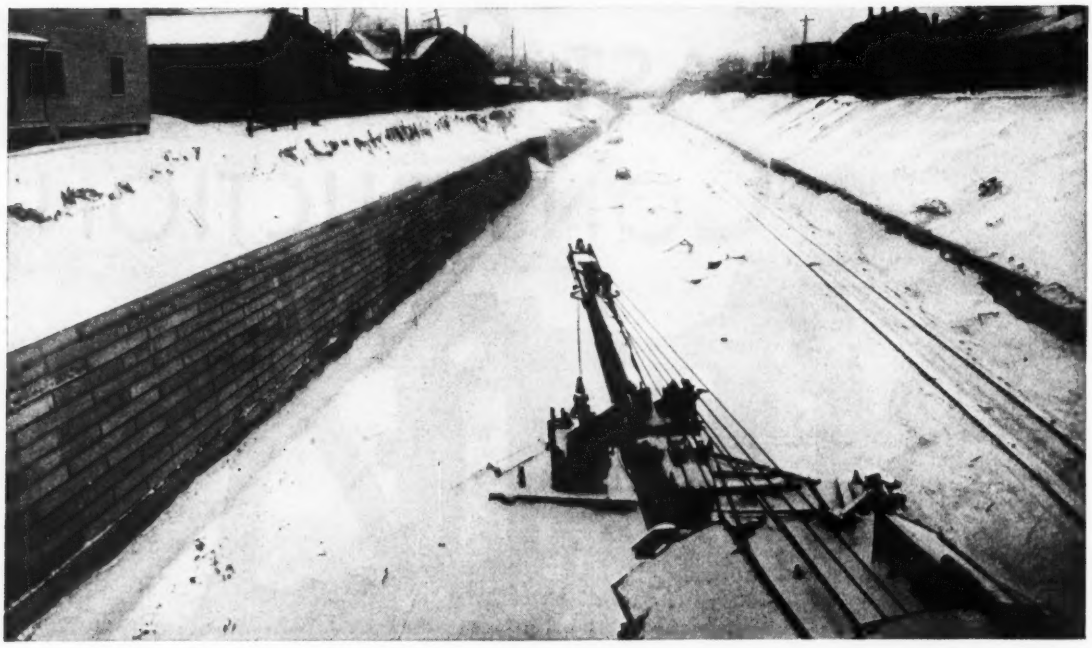

You Can Build This Concrete Retaining Wall-*in Winter!*

No need to delay that embankment project important to your road's efficiency, just because winter's here. Snow and cold are no bar to the erection of a retaining wall — not even of concrete — because Federal *precast* units go direct from cars to wall in *any* weather.

No intricate forms to build—no expensive foundations below frost line—no stripping or rubbing face — none of the disadvantages of the poured concrete wall. On the contrary all of its strength, stability and permanence, *plus* the greater beauty of fine masonry, *plus* salvage value—*all at lower cost than poured concrete!*

Note the Y-shaped headers which interlock with the stretchers, holding the backfill without the use of a third member in the bank. This results in a cellular wall of great strength and with no plane of cleavage in the bank.

The trend toward this distinctive 2-piece construction is unmistakable. Important roads like the Pennsylvania, New York Central, B & O, Grand Trunk, Northwestern, and many more, have had Federal walls in service over a period of years. Illustrated booklet on request.

FEDERAL-AMERICAN CEMENT TILE CO.

Executive Offices: 608 South Dearborn Street - - - - Chicago

Plants near CHICAGO · NEW YORK · PITTSBURGH · BIRMINGHAM

Concrete Products *for Over 25 Years*

FEDERAL 2 piece Concrete CRIBBING

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CONTENTS FOR DECEMBER, 1930

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Railway Engineering and Maintenance

Volume 26 December, 1930 No. 12

Record Expenditures

THE announcement by R. H. Aishton, chairman of the Executive committee of the Association of Railway Executives, that the Class I railways of the United States spent more money for new equipment and for additions and betterments to their properties in the first nine months of this year than in the corresponding period of any year since 1923 comes as a pleasant surprise to many. It is especially noteworthy that these expenditures exceeded those for the same period last year by $125,000,000, or at the rate of more than $500,000 per working day. Even more interesting to employees of the engineering and maintenance of way department is the fact that expenditures for roadway and structures exceeded $425,000,000 in this nine-month period and were nearly $63,000,000 greater than last year. It was expenditures of this character that the railway executives promised President Hoover a year ago as a means of promoting business stability. How well they have kept faith with the president is shown by these figures.

In considering these figures, one should bear in mind that they refer only to those expenditures chargeable to capital account, as contrasted with outlays for the upkeep of the properties, chargeable to operating expenses. In maintenance of way, the record has not been so favorable. Here the roads are limited by their earnings, for they must finance all ordinary upkeep out of current revenues, and they cannot spend what they do not earn.

For maintenance of way work, the railroads spent approximately $95,000,000 less in the first nine months of this year than in the corresponding period of last year. Yet, severe as the curtailment has been in this branch of the service, if both maintenance and capital expenditures are considered, the net result is a decrease of only $32,000,000 or 3 per cent from last year. This is the real measure of roadway expenditures, for the line between the two types of charges is largely an accounting one, most projects involving work chargeable to both accounts. Surely a record such as this in these days should be cause for gratification to every railway man, and justification for restored interest and enthusiasm on the part of railway supply men.

A New Attitude

The public is entitled to the best transportation at the lowest reasonable cost. Where the rail carriers are prevented through legislation or regulation from competing fairly with new or old forms of transportation, or where the service rendered by the competitor is a subsidized one, such unfair handicaps should be removed.

The railroads are asking a new spirit and attitude on the part of legislative and regulative authorities through a recognition that the railroads are engaged in a business subject, as other business is, to the operation of economic laws and should accordingly be permitted to adapt themselves quickly to changes in economic conditions which confront them; and through a recognition that railroad operation is a fundamental public necessity and that the maintaining at all times of an efficient national system of transportation, adequate to the business needs of the public, is necessary, if we are to progress as a nation.

From a statement issued by the Association of Railway Executives on November 20.

33 by '33

WHEN the Safety Section of the American Railway Association, in 1924, set as a goal for the railways, a 35 per cent reduction in railway accidents by the end of 1930, it imposed on the railroads a task of no ordinary magnitude.

There were many who pointed to the long and well-established safety departments of many of the railways as indicating that all practicable measures had already been taken and that further large reductions in accidents, while highly desirable, were impossible of attainment. Others, however, contended that still further decrease was possible, their attitude being crystallized by the statement made at that time by R. H. Aishton, president of the American Railway Association, that "It can be done."

Now that this seven-year period is drawing to a close, it is possible to measure the results. Best of all, the goal has been attained and exceeded. It is significant that 822 less employees have been killed while on duty in 1930 than in 1923, while the number of employees injured has been reduced by 111,000. Equally striking is the fact that in 1929 there were 10,312 fewer train accidents than in 1923, resulting in a saving of more than $5,000,000 in the cost of clearing wrecks and $8,000,000 in damage to railway property.

Such are the results of the last seven years. What of the future? The Safety Section has anticipated this question by setting up a new goal, "Cut employee accidents 33 per cent by the end of 1933."

Excellent as the record of the last seven years has been, an analysis of those accidents that still occur show that the vast majority are preventable. Such accidents are far more frequent on some roads and on

some divisions than on others. It is here that the greatest improvement can be made, if and when the local officers become "safety conscious." The reduction of accidents is no longer the task of professional safety officers. It is the responsibility of every officer supervising the activities of other men, and the extent of the responsibility varies with the degree of hazard of the work. It is as much the duty of the local roadmaster or bridge and building supervisor and of the division engineer to see that work is done safely as it is to see that it is performed economically and expeditiously. In fact, safety and economy go hand in hand, and that division which has the fewest accidents will normally be found also to be among the most efficient otherwise.

The maintenance of way department comprises one of the largest groups of railway employees. Their work involves many opportunities for injuries. If the railways as a whole are to attain the new goal, the maintenance department must do at least its full share to make possible the 33 (per cent reduction in the number of accidents to employees on duty) by '33.

Checking Section Tool Equipment

ON A LARGE part of the railway mileage of the country, the regular section forces are being reduced to the normal winter basis. This is the season, therefore, when maintenance officers are required to take stock of the tool equipment on their sections, with a view to determining what tools should be retained over winter and what equipment should be returned to the stores department.

Small tools constitute an important part of the maintenance equipment of the railways and represent an investment of considerable magnitude. Any tool that is not in use represents, therefore, an investment that is not bringing in any return. For these reasons there should be no laxity in the methods that are followed in controlling their distribution and use.

The practice of allowing the section forces to accumulate and retain tools over extended periods when they are not needed, serves no useful purpose. Not only is this excess stock allowed to remain idle, but, in many instances, purchases of similar tools are made for other work, thus increasing the investment in tools out of proportion to the needs of the railway. At the same time, where such a practice is in vogue, many of the tools thus accumulated will be found to be out of repair and will eventually find their way into the scrap car, although most of them could be made usable at small cost. The winter months when the tool requirements are at a minimum afford a convenient time to recondition these tools.

The tool requirements on different districts of a railway vary with the program of repair and renewal work, so that what may be a normal requirement for a given district this year may be above or below the requirements for succeeding years. For this reason, unless effective control is established, new tools will be purchased instead of shifting the surplus to the point where additional tools are required. One of the chief advantages of a definite method for controlling the distribution of tools, however, lies in the fact that it systematizes this feature of maintenance work.

Lack of system always means laxity, and in this case usually results in a loss of appreciation of the value of the tools by both the section forces and the supervisory officers. Where an accumulation of tools in excess of requirements is permitted during the winter, it is practically certain that a similar surplus will accumulate during the working season, and that tool costs will be higher than they should be, with no ensuing benefits. Because of the wide distribution of this type of equipment and the large number of items involved, control is difficult, even when fully systematized, and it can be made effective only by checking periodically the number of tools on hand at every section headquarters. This season of the year, when the requirements are approaching a minimum, offers an excellent opportunity to do this.

A Successful Season

THE COLD wave which swept over most of the country late in November brought the season of active track work to a close. While the expenditures for the maintenance of track have been curtailed severely on many of the roads in the closing months of the year, it is doubtful if the tracks over the country as a whole have ever entered the winter in better condition. This is due in large measure to the liberal expenditures that have been made continuously during the last six years for the strengthening of the properties. It is due also to the unusually dry weather that prevailed in most areas during the summer and fall.

Water has long been recognized as the arch enemy of good track. Years of heavy rainfall are periods of difficult maintenance. Conversely, periods of drought are times of slow deterioration. Such was the past season. Equally favorable were circumstances attending the advent of the first cold wave late in November. Instead of following a period of heavy rain which saturated the roadbed, as so frequently occurs, the cold wave that swept over a large area of the north this fall was accompanied by little or no rain, and froze the roadbed at a time when it contained the minimum moisture. This condition also contributes to good winter track.

All in all, track men are entering the winter with more than normally favorable conditions. With such a start they should be able to keep abreast of and ahead of their work throughout the cold weather and reduce emergency measures to the minimum.

Inspecting Water Stations

MAINTENANCE officers are sometimes inclined to feel that they are required to devote too much of their time to the inspection of the various structures and facilities under their jurisdiction. The attitude of those who take this view is that their subordinates who have direct charge of the maintenance of these facilities should be held responsible for their conditions that frequent inspections on their part are, therefore, unnecessary, and that their time can be better spent in attending to their routine duties.

Water stations afford an excellent example of a facility that, on most roads, is not included in the list of facilities that receives such frequent and searching inspection as is given switches. While a water station does not possess the potential dangers to life or property that a switch does, the continuity of train operation depends upon its proper functioning to an extent that is seldom realized until a break-down occurs.

It is impracticable for supervisory officers, even those in closest touch with the facilities under their

charge, to know in detail the condition of the equipment in plants as numerous and widely separated as water stations. Since so much depends on the reliability of these plants, it is important that those in charge of them know at all times that they are in condition for dependable operation. If defects exist or damage to the equipment occurs, they should be known immediately, so that measures can be taken to put the equipment in proper shape in time to avoid interruption to the water supply. Repairs made in time to prevent such an interruption can usually be made at less cost and they have a far greater ultimate value to the railway than those that are made after a water failure.

The best way that has yet been devised for collecting and recording this information is through a regular system of inspection and reports at frequent intervals. No effective or economical system of maintenance is possible without a definite knowledge of the requirements of all of the plants on a given territory. Furthermore, there is no better way by which supervisors of water supply and division engineers can gain this knowledge and keep it up to date than by making regular and detailed inspections and recording their observations.

A Movement Toward Better Taste

PIONEERS, as a class, cared little for the beauties of nature and when, as in America, they had prospered to an extent that permitted them to give thought to what they considered beauty in their homes and surroundings, their interests centered on star-shaped flower beds, cast-iron "nigger" hitching posts and metal picket fences. Shrubbery was too suggestive of wild underbrush to have any appeal. The embellishment of the railway station grounds followed the same artificial trends. White-washed boulders laid in geometrical patterns were especially popular and the adoption of so-called "landscape gardening" led to the clipping of hedges and shrubbery in fantastic forms, even to the extent of evolving privet or barberry locomotives after many months of painstaking culture.

If this misguided effort at beautification had any redeeming feature, it was that of instilling an appreciation of neatness and orderliness among the employees. But the artificial results obtained were certainly not always beautiful, and in many cases cost much more in time and money than would have been necessary to have produced far more attractive effects with plantings of trees and shrubbery that are allowed to grow as nature intended that they should grow.

But times have changed. Natural effects are becoming increasingly popular with both the home owner and the railway, although trimmed hedges and formal flower beds have remained in favor for use in appropriate surroundings.

In this movement for better taste in efforts to improve the appearance of railway property, the Western Pacific has gone one step further in adopting a color scheme for its buildings that will make them fit into the surroundings. Instead of bright colors that make every building even to the humble outhouse stand out like a splash against the landscape, subdued tones have been adopted that blend into the surroundings.

This plan is described in an article by Colonel J. W. Williams on page 553 of this issue and, as will be noted, it embodies features that are distinctly in the direction of economy. Painting the trim into the body, for example, saves money. But what is more important, the plan establishes standard colors—so the railway is assured the economy to be realized from such standardization.

This system of painting buildings raises an interesting question: Does the oft raised objection to standard colors for roadway buildings arise from the fact that they result in a monotonous sameness of the buildings along the line, or does the objection arise after all from the fact that the colors which have been selected as standard are inappropriate and, therefore, jarring to the eye? The management of the Western Pacific is convinced that the fault has lain in the colors and not in the principle of standardization. The quest for good taste does not necessarily lead to larger expenditures.

Masonry Failures

ON PAGE 542 of this issue the reader will find a treatise on masonry failures which we are especially pleased to publish because we feel that it comprises one of the most masterly presentations of the subject that has ever appeared. While the term masonry as commonly accepted covers any structure built of stone, clay products or concrete, the authors of this exposition chose to direct their attention primarily to stone masonry. However, as will be clear from what follows, much of the subject matter is equally applicable to concrete structures and some of it to brick masonry as well.

Failures of masonry structures can be divided into two classes, namely, those that result from the inability of the structure to withstand external forces applied to it and those resulting from chemical or physical disintegration of the materials of which it is composed. The first class, which may be roughly designated as design failures, may be manifested by the presence of cracks or open joints or other evidences of overstress of various parts of the structure, or by settlement or displacement of the structure as a whole, due to the inability of the foundation to sustain the loads imposed. The second class embraces such difficulties as spalling or softening of the face of the structure and may result from a variety of causes, although one of the most important is the freezing of water that has been permitted to gain entrance into the structure. However, in not a few cases, the cause dates back to the time of construction and comprises either poorly chosen material or poor workmanship or both. In stone masonry, it has been more often an unfortunate choice of stone, while in concrete the fault lies more often than not in poor workmanship.

The effects of inadequate design on the one hand and poor workmanship or materials on the other sometimes overlap, one condition aggravating the other. But in general, one or the other of these agencies comprises the dominating or underlying influence, and through study of the structure should disclose the condition or conditions which have been primarily at fault. It is here that we find the secret of the proper inspection or investigation of defective masonry, namely, the prime necessity of distinguishing between defects resulting from overstress and defects which must be ascribed to local disintegration of either a physical or chemical nature. This must be known definitely before remedial measures are undertaken for the cure in the one case is entirely different from the cure in the other.

Above—The Caterpillar tractor drawing the Killefer rotary scraper
Right—A back sloper was used to shape the inside slope

Tractors Show Flexibility in Maintenance Work

Peoria & Pekin Union applies Caterpillar equipment to a number of different operations

DITCHING, culvert cleaning and a number of other operations have been carried on this year in a successful and economical manner on the Peoria & Pekin Union by using Caterpillar tractors in combination with various units of auxiliary equipment, such as graders, ditchers, draglines and special attachments. Different combinations of this equipment were found to have a high degree of flexibility, and other equipment, such as teams and work trains, was dispensed with entirely, except in one case where a work train was used to dispose of waste material. Records of the actual cost of this work, which were kept by the road, show that in one case it cost only 27 cents a cubic yard to deepen and widen a cut ditch, while in no case was the cost of ditching more than only a few cents higher. Furthermore, officers of the road are highly pleased with the performance of this equipment and with the quality of the completed work.

The Peoria & Pekin Union is a terminal railroad interchanging traffic between 14 roads in Peoria, Ill., and also operating a double-track line to Pekin, Ill., about nine miles, along which the grading operations were conducted. Early in the spring of this year a Model 15 Caterpillar tractor was purchased by this road to be used for a number of tasks for which a preliminary study had shown it to be suitable. One of the first operations which the tractor was called upon to perform was that of cleaning two reinforced concrete culverts which had become almost completely filled. These culverts, which are situated in the East Peoria yard of the P. & P. U., are 5 ft. 10 in. wide, 5 ft. 6 in. high and about 600 ft. long. Local conditions which are beyond the control of the railway affect the drainage conditions adjacent to these culverts to such an extent that it is necessary to clean them about every four years. This year each of them had become filled to within about 16 in. of the top and it was decided to make an attempt to clean them with a dragline bucket operated by the Caterpillar tractor.

Accordingly, the tractor was equipped with a Willa-

mette-Ersted double-drum hoist and was placed in position about 80 ft. from the end of one of the culverts. The Willamette-Ersted double-drum hoist is a power take-off which is attached to the rear of the tractor and, in this case, was used to operate the cables of the dragline. A rigid timber A-frame equipped with two blocks to accommodate the cables was constructed near the opening. A nine-inch block was attached to the ceiling of the culvert at the opposite end and six-inch blocks to carry the tail line were attached to the walls of the culverts at the proper intervals. A four-inch roll was hung from the ceiling at the end near the tractor to prevent the bucket line, which carried the loaded ½-cu. yd. bucket, from coming in contact with the edge of the concrete. The bucket line consisted of a ½-in. cable while a 5/16-in. cable sufficed for the tail line. The most difficult problem encountered in carrying out this project was that of stretching the cables through the culverts, it requiring half a day for a man to pass through one of them. The entire project of cleaning both of the culverts was completed by two men, one operating the tractor and the hoist and the other assisting him. The material which was removed from the culverts was deposited near the openings and was later picked up by a work train equipped with a clam-shell bucket.

Four years ago when one of these culverts was cleaned by hand methods, the cost of doing the work totaled $1,178, while this year the cost amounted to only $210.55, a reduction of $967.45. The cost of cleaning both of the culverts this year was only $434.10, as shown by the following itemized statement:

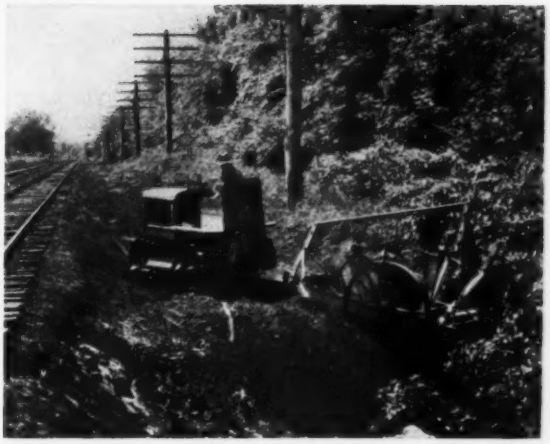
Material and labor of setting up equipment	$ 74.99
Labor of actually cleaning the culverts	173.96
Gas and oil for tractor	25.79
Clam shell—includes picking up, loading and unloading material	51.91
Work train expense	107.45
Total	$434.10

The project entailed the removal of 444 cu. yd. of material, thus giving a unit cost of $0.98 per cu. yd., which is quite low for this type of excavation.

A Need for More Knowledge

Officers of the Caterpillar Tractor Co., Peoria, at about this time were very desirous of ascertaining in what ways their equipment could be applied further to railway work and also what the best methods of application were. With this idea in mind, they approached the P. & P. U. late last spring with the request that they be allowed to use the right of way of that road for purposes of research, it being their idea to supply all of the equipment and labor. The principal purpose was to determine just what types of grading equipment, when used in connection with the Caterpillar tractor, would accomplish each particular grading operation in the most efficient and satisfactory manner and to ascertain also the actual cost and the quality of the work. As this proposition was agreeable to the railroad, the Caterpillar Tractor Co. put one of its Model 15 tractors and various grading equipment to work deepening and widening cuts on the main line to the standard section.

The grading equipment which was used in conjunction with the tractor consisted of a Caterpillar No. 10 grader, a Miami one-man, power-operated scraper, a Killefer rotary scraper and a Martin ditcher. Some of this equipment was owned by the road and some was furnished by the manufacturers. The personnel of the grading outfit consisted of an operator, a helper and a flagman. The operator was entirely without experience in Caterpillar tractor operation, but within a short time



Dumping the Miami Scraper Over the Embankment

The Miami Power Scraper Coupled to the Tractor

One Ditch Was Cleaned with a Dragline

A Section of the Right of Way Before Any Work Was Done

Loading the Tractor, the Miami Scraper and the Caterpillar No. 10 Grader

he was handling the tractor in an expert manner. This outfit had no precedent to follow and, therefore, as it gained in experience it altered its methods wherever it was thought possible to effect an improvement.

The cuts which were chosen for the tests were from 300 to 700 ft. long and were shallow and narrow. They did not conform closely to the standard section. As the material presented no unusual aspects, it was easily handled. The ballast on this road consists entirely of cinders.

The Procedure

The tractor first entered the cut ditch with the Caterpillar grader and loosened the material on both the inside and the outside slopes. This grader could be turned around on a very small radius and had a blade seven feet long which could be adjusted to any desired angle of slope. The loosened material was pushed to the center of the ditch by this equipment and was then removed to the end of the cut or other point of disposal by either the Killefer rotary scraper or the Miami power scraper. The latter is a two-wheeled unit with a one-cubic yard capacity pan which is operated from a power take-off at the rear of the tractor. The pan may be lowered to the cutting or loading position, or raised at any time regardless of the direction of movement of the tractor-scraper unit. All operations of this grader are controlled by the operator of the tractor who manipulates a lever which is located conveniently at his right. This scraper traverses the full length of the cut in each operation, removing the loose material at the middle first and working toward the ends. It has been estimated that this scraper will operate economically for hauls up to about 1,000 ft., thus indicating that it may be used economically in cuts as long as 2,000 ft. When dumping its load at the end of the cut, the Miami scraper may be backed over the side of the dump a considerable distance, thus affording a means of spreading and distributing the material during the dumping operation.

The Killefer rotary scraper is cylindrical in shape and has a capacity of 16 cu. ft. It is most efficient for short hauls and is manipulated by a line in the hands of the operator of the tractor, being coupled to the tractor in the ordinary manner. This scraper travels on shoes or runners and cannot be backed over the dump to distribute its load as can the Miami scraper. However, it has two dumping positions, one dumping the material completely, while in the other the material is spread while it is being dumped. This scraper, when coupled to the tractor, is used also to cut cross drains at the ends of the cuts and at other places.

When the cut ditch had been roughed out to the approximate section, the outside slope, which is 1½:1 on this road, was smoothed up generally by means of the Martin ditcher and any loose material remaining in the bottom of the ditch was thrown up along this slope and leveled off. The Martin ditcher was found to be more suitable for this final smoothing-up operation as it has no wheels and does not have a tendency to mar the slope. The inside slope of the ditch was made to conform to the standard section by the use of a special attachment for the Caterpillar grader, which is called the "back sloper." The cuts were then finished by hand labor wherever the necessity for such work was indicated.

Only a Small Force Necessary

Throughout these tests it was never necessary to have more than three men on the job. These included the operator of the tractor, a helper and a flagman. The helper assisted in coupling up the equipment, which requires two men in most cases, and operated the tractor when the Caterpillar grader was being used. It is even thought that the flagman may be dispensed with as it was never necessary to obstruct the track with any of the equipment.

Cost data covering all the grading operations were kept by the engineering department of the road and show that the unit cost of the grading was low. In a typical cut from which 455 cu. yd. of material was removed, the cost per cubic yard was only 31.5 cents. The movement of this yardage entailed an average haul of 336 ft. and the grading was completed in 60.5 hours. A statement of the various items entering into the total cost per cubic yard in this particular cut is as follows:

Machinery depreciation and repairs	$0.045
Supplies	.065
Labor	.188
Dressing (20 man-hours at 38 cents an hour)	.017
Total cost per cubic yard	$0.315

Dragline Even More Successful

Even more striking than these figures is the low cost obtained by deepening and widening to standard section a 600-ft. cut ditch with a dragline bucket operated by a Caterpillar tractor. For this purpose, an A-frame was securely anchored at one end of the cut and was equipped with blocks for dragline cables. A "dead man," consisting of a tie sunk about two feet into the ground, was placed at the other end of the cut. The bucket that was used in this case had a capacity of about ½ cu. yd. The tractor, which was owned by the road and which was equipped with the Willamette-Ersted double-drum hoist, was placed about 25 ft. away from the A-frame on the side opposite the cut. As the material was removed from the cut, it was deposited in a pile near the A-frame and was later spread out and pushed over the embankment by the Miami scraper coupled to the tractor. After all the material was removed from this cut, the side slopes were smoothed up with the Martin ditcher, also operated by the tractor. Records of the road show that 160 cu. yd. of material were removed from this cut and that the cost was only 27 cents per cubic yard. This cost was itemized as follows:

Setting up equipment	$0.019
Material for A-frame	.048
Labor of cleaning cut	.104
Supplies	.024
Rental of tractor and equipment for two days	.075
Total cost per cubic yard	$0.270

The P. & P. U. has a long embankment, on one shoulder of which material has accumulated over a number of years to such an extent that the drainage has been obstructed materially, causing water to flow toward the track instead of away from it and down the slope. By employing a Martin ditcher in connection with the Caterpillar tractor, it was found that this shoulder could be quickly cut down to the proper height. In this operation four men, in addition to the operator of the tractor, were required, these men being used to weight the ditcher down so that it would cut effectively. In this way, 4,000 ft. of the shoulder was cut down in about 2½ days. It was necessary, of course, to finish the job by hand and accordingly the shoulder was smoothed and dressed by the section gang. This combination of equipment was also found to be of advantage for opening ditches and in one case a ditch 1,000 ft. long was opened by three trips after the ground had been broken by a plow.

Officers of the Peoria & Pekin Union have found that, for their particular needs, the Caterpillar tractor, when used in connection with different types of grading equipment, has several distinct advantages. They point out that experienced men are not required for operating the equipment and that only two men are necessary to operate any combination of the equipment. Furthermore, they believe that the ability of the tractor to travel under its own power and to be loaded under the same power is an advantage of especial importance.

They also add that obstructions and narrow rights of way were found to be no obstacles to the efficient operation of the equipment and, as no work train is required, no time is lost in clearing trains. In addition, they find that, with the aid of a few accessories, the tractor becomes very flexible and may be used on some type of maintenance of way work nearly all of the time. This is demonstrated by the fact that the tractor which this company purchased early this year, when not being used in grading work, has been utilized to pull cars, to furnish power for hoisting brick and mortar on construction work, and for various other purposes. This machine has not been idle since its purchase and it is expected that it will be possible to find something for it to do throughout the year.

All of the foregoing work was done under the direct supervision of E. H. Thornberry, chief engineer of the Peoria & Pekin Union, while the Caterpillar Tractor Company was represented on the job by O. E. Andren, general supervisor of industrial sales of that company.

The Martin Ditcher Was Used to Cut Down the Shoulder

Another View of the Right of Way After the Work Was Completed

Masonry Failures

*Their Causes and Remedies**

Bridge and Building Association discusses this subject from many angles

A. B. Scowden
Chairman

IN MASONRY structures the causes for failures are not always easily determined. Masonry structures can generally be examined on the surface only, while the conditions responsible for failures frequently are situated below, behind or inside the structure. Conclusions must be drawn from outside observations as to the hidden causes before the correct remedy can be determined.

Most stone masonry piers and abutments were constructed at a time when train loadings were lighter than at present and modern loadings will in some cases produce settlement of the masonry structure. Where loadings are nearly evenly distributed over the foundation, are vertical in direction, and the masonry settles uniformly without breaking the bond between the stones, the settlement is not easily detected by superficial examination.

Where settlement is suspected, arrangements should be made for level readings at several points on the masonry and repeated at intervals to determine the rate of sinking, if any. Occasionally these will show that the loads have compacted the foundation to such an extent as apparently to stop the sinking. Even so, the structure will require close watching to be sure that the movement is not resumed. When settlement is found to be progressive, the remedies can be divided into three classes:

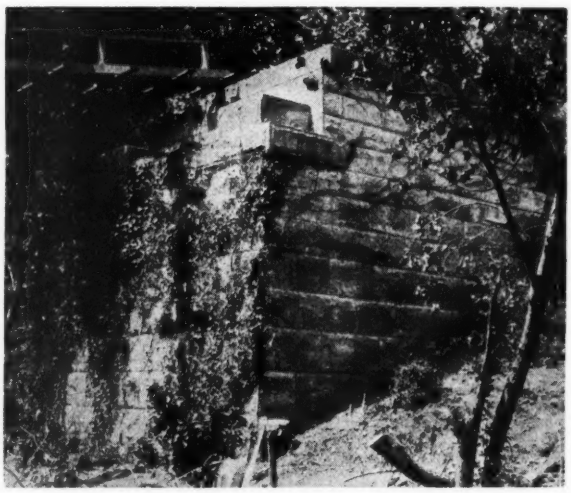
(a) Reducing the load on the structure:—This is most frequently resorted to as a temporary expedient, supporting bents being built to carry a portion of the load and thereby partly relieve the masonry.

(b) Increasing the bearing area:—Work of this character is usually referred to as "underpinning." After the masonry is partly relieved of its load, the foundation below the lowest masonry course (or its grillage) may be excavated for some distance back from the face, and a wider concrete course built underneath the outside faces of the old masonry (surface underpinning). At times the whole bottom area is underpinned.

(c) Solidifying the foundation:—Where the ground under the masonry consists of stones, gravel, or sandy mixtures, it is at times possible to force thin cement grout into it under pump pressure, thereby increasing its bearing capacity and spreading the load over a larger area of underlying foundation. A high content of clay or loam would make this method ineffective.

Partial overloading may be caused by an uneven bearing capacity of the foundation, or by horizontal or inclined forces, usually earth pressure, which result in uneven loading on the foundation.

The uneven character of the foundation is not a frequent cause, but occurs sufficiently often to warrant mention. A typical example is a foundation consisting partly of solid rock and partly of soil. Settlement in the latter will show first as sagging in the horizontal joints, followed by loosening up of the vertical joints, and vertical cracks in the stones in one course directly above the open joints in the course below. The loosening up of the joints starts from the bottom and continues upward. The local application of remedies prescribed for general settlement should be considered, but often the most efficient method of cure consists in transferring the loads to the solid portions of the foundation by means of grillages or a heavily reinforced concrete bridge seat to permit the bonding in the damaged portion of the masonry to be restored by grouting and pointing.

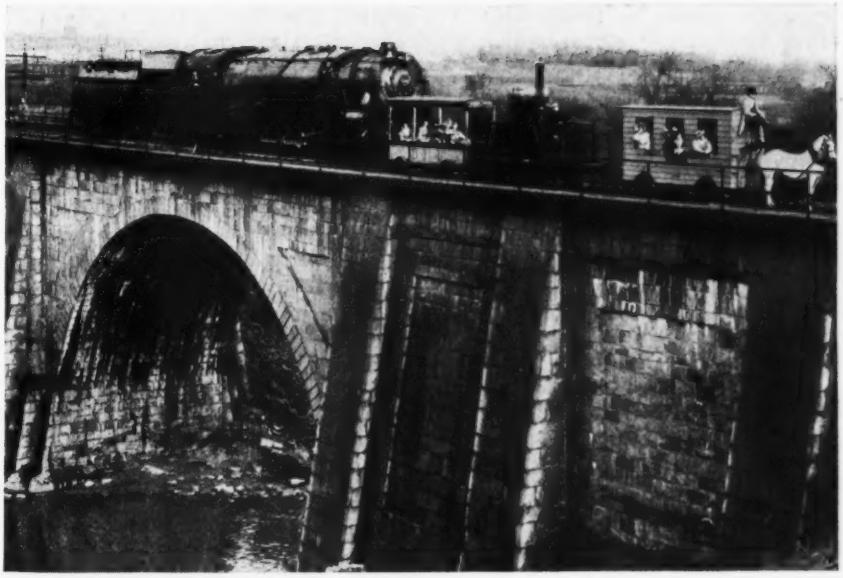


An Abutment that Was Built Over 50 Years Ago

The usual cause of uneven foundation loading is due to horizontal pressures from backfilling, which result in excessive toe pressure. A condition of this character is indicated by the crowding of the steel against the anchor bolts, large offsets between top and bottom shoes, followed by bending or shearing of anchor bolts, loosening up of the stones to which anchor bolts are fastened, reduction in surface batter and crowding of steel against back walls.

Horizontal anchor rods carried from the face of the

*Abstract of a report presented at the convention of the American Railway Bridge and Building Association at Louisville, Ky., on October 21.



The Carrollton viaduct, a 100-year old bridge on the Baltimore & Ohio near Relay, Md.

masonry to an anchor wall or piling in the embankment will reduce the horizontal pressure and provide at least temporary relief. This method is particularly effective in U-abutments, where the wings show signs of overturning, the rods tying the two wings together.

Tile drains or other means of removing water from the embankment back of the masonry will reduce the horizontal pressure. Buttresses placed in front of the masonry are effective if properly constructed. Facing with concrete for either the full height or part way up is a good type of construction.

Underpinning of the front portion of the old masonry with a wider concrete footing will at times prove a desirable solution of the problem. Partial removal of the backfilling and the construction of an additional span may have to be resorted to where other methods are found impracticable.

Reduction of Foundation Area

The foundation bearing area may be reduced by underwashing or scour and in rare cases by sliding. The extent of the scour can usually be determined by rod soundings. In deep water and a swift current it may be necessary to employ a diver and, when directed intelligently, he will usually be able to provide reliable information regarding the conditions existing below the surface.

Riprap, derrick stones, stone slabs and wire fencing are well known protective remedies. One corrective measure is to restore the original foundation. With a soil foundation this can often be done, small stone or coarse gravel being deposited on that portion directly below the masonry and compacted with sand or grout. The slope should be protected to prevent scour in the future. In most cases, however, underpinning with concrete will prove the most satisfactory remedy.

A somewhat special condition develops when a masonry structure on a pile foundation has been underwashed to a considerable depth. The removal of the soil from around the piles has reduced their carrying capacity for vertical loads, and the unsupported length of piling has left the structure more vulnerable against such horizontal forces as earth pressure and the force of current and drift. At times, particularly during flood periods, it may become necessary to take emergency action in order to provide temporarily for the safety of traffic. Usually this is accomplished by falsework, but other means may have to be employed.

Horizontal Movement on Foundation

The horizontal sliding of a masonry structure as a unit occurs at times, where the foundation is smooth and the bottom course is not securely anchored to it. The obvious remedy is to provide adequate anchors, which may be in the form of rails set and grouted into the rock, or consist of anchor walls carried into the foundation and extending partly up on the masonry.

Fortunately, moving foundations are rare. Fine sand moving slowly under the action of subterraneous streams (quicksand) or boggy ground are examples. Where it is determined that motion in the foundation is the cause of masonry movement, a close study of conditions above and below ground is required before an attempt to cure is undertaken. Draining the water from the subsoil is probably the most efficient remedy. Where the movement is caused by the pressure from an adjoining embankment, this may have to be removed and an approach span installed.

Reduction in Bond Between Stones

The mortar bond is an essential part of the stone masonry structure. The loosening or falling out of the mortar is the first sign of distress and the restoration of the bond by pointing or grouting will, as a rule, prevent the development of more serious defects.

Where masonry is laid up without adequate bonding and the backing consists of small stones, it is likely to loosen or bulge from pressure or vibration. In such cases, where both faces are accessible, holes can be drilled for tie rods, and occasional courses clamped. If the backing is reasonably free from mud and clay it can be solidified by pouring grout into it, converting it into a cyclopean concrete.

Local overloading may result in crushing the bearing stones, the shoes wearing into them, or if the mortar bond is disturbed, bending strains may de-

velop which will cause the stones to break with vertical cracks. Where the bearing stones which support the shoes are of heavy section or of harder and stronger material, the cracks often start in the second course below the bridge seat. Defects in bearing stones may also develop from excessive horizontal forces which are transferred through the anchor bolts to the stones, causing them to split.

Repairs of a more permanent character are usually made in the following way:

1. Replacement of bearing stones with precast concrete blocks. These should be reinforced and the concrete mixture designed to give them a high compressive strength.
2. Enlarging of shoes to provide increased bearing area and wider distribution of the load on the masonry. This is also often accomplished by the use of steel grillages.
3. Rebuilding the top portion of the masonry with concrete.

Surface Disintegration

Most masonry is built of sandstone or limestone and less frequently of granite or other rocks. In any case, the stone will show disintegration in time, as no rock is entirely permanent, although there are large variations in the degree of durability, especially in frigid climates. A slow, gradual and fairly uniform surface disintegration is not a serious matter, as the heavy body of masonry has lost very little of its usefulness by the small loss of stone on the face. Often, however, stones at various locations in the masonry structure develop much more rapid deterioration than others.

When the slow crumbling of a stone develops into a breaking away of larger spalls, destruction proceeds rapidly. Before applying protection, all loose and soft parts of the old stone must be removed. The placing of a thin concrete facing, bringing it out to the face of the old masonry, is usually not effective, but the patching of scattered stones with concrete 12 to 18 in. deep will ordinarily prove of value, at least as a temporary expedient.

Reinforcing a Bridge of Five 40-Ft. Arches on the Chicago & Alton near Delhi, Ill.

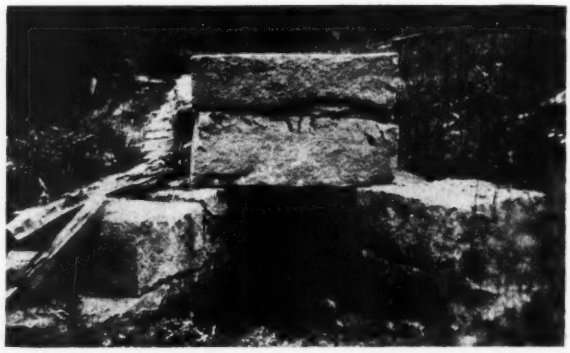
Where larger areas or the complete surface of the masonry require protection, this is accomplished either by means of a heavy concrete facing, using forms, or by a lighter cement mortar surface, applied with an air gun (gunite).

Concrete facing must be provided with a suitable and effective foundation. Where the deterioration of the masonry has not progressed deeply below the original surface, concrete of 6-in. to 12-in. thickness, well anchored, has often proved effective. Where the stone work is in a more advanced state of disintegration, a heavier section is required.

Sealing coats for concrete and gunite usually consist of minute particles of iron, which through oxidation fill up any surface pores. They are available under various trade names.

Arches

In a masonry arch ring when there is a marked change in the intensity or application of the outside forces, the arch ring will have a tendency to change its form, so as to adjust itself to the different conditions of loading. Weep holes in abutment walls or perforated drainpipes carried into the embankment and pointing of the arch ring will often at least retard further development.



Many Stone Box Culverts Were Constructed for an Important Line that Was Completed this Year

When more extensive repairs become necessary, the lining of the inside surface of the arch is the simplest and most economical procedure, but this expedient can be used only where the conditions permit the reduction of the opening.

Most of the defects developing in abutments apply also to retaining walls and are subject to similar methods of correction. Drainage at close intervals is of special importance. Broken cover slabs of stone box culverts can be jacked up to insert rails beneath them. Sidewalls can be repaired with concrete. In many cases, however, the cost of the repair work will prove too high for the benefits obtained and in such cases replacement with pipe culverts is more economical in the long run.

Conclusions

Stone masonry structures on the railroads represent a huge original investment, made with the expectation of permanency or at least a long service life. A large number of these structures are retired yearly and replaced with other types of construction, usually at a much higher cost than that of the original structure. While a number of replacements are due to obsolescence or inadequacy and also due to failures from unexpected causes such as floods, there are undoubtedly many cases, where the failures are caused by neglect and lack of upkeep. Stone masonry is erroneously referred to as "permanent," and the feeling of safety created by this attitude may cause the maintenance officer to give less attention to the early signs of distress than they deserve. The fact, that minor defects seem to have such a small effect on the safety and usefulness of the structure as a whole, may result in deferring the cure until the ailment has progressed too far.

Ailments of concrete masonry which are due to

foundation conditions are practically the same as those previously described for stone masonry and the remedies are so nearly identical that the previous discussions on this subject will apply. The most frequent defects in concrete masonry are due to the lack of adhesion in the mass and disintegration of the surface. These features were gone into extensively by the association in its committee report for 1926, entitled "Method of Repairing Disintegrated or Poor Concrete."*

Committee: A. B. Scowden, B. & O. (chairman); L. A. Gillett, F. E. C.; E. Cahill, D. L. & W.; I. L. Simmons, C. R. I. & P.; A. C. Irwin, Port, Cem. Assn.; W. A. Batey, U. P.; C. D. Turley, I. C.; G. W. Sawyer, D. & H., and H. C. Swartz, C. N. R.

Discussion

The discussion of this report consisted principally of the narration by various members of means by which failures were overcome and defective conditions corrected. A number of men questioned the advisability of attempting to repair old piers and abutments because of uncertainty as to the material inside or under them. A. I. Gauthier (B. & M.) contended that where space permitted, sufficient additional material, in the form of concrete, should be added to the faces of an abutment or pier to enable it, in combination with the old masonry, to carry any load that might be thrust upon it. Where space does not permit such an addition to be made, he said, there is no recourse but to tear the structure down and rebuild it. E. C. Neville (C. N. R.) described the manner in which he has repaired a number of piers by chipping off defective concrete with air hammers, drilling holes for anchor bolts and then adding a two or three-inch jacket of gunite. He also stated that he has used gunite on brick work, where he has found that it adheres so tenaciously to the brick that frost action splits the brick.

In the course of the discussion, reference was made to several structures, built a century ago for the traffic of that day, which are carrying modern loading with little or no alteration or strengthening. Included among the structures referred to were the Baltimore & Ohio arch spans at Relay, Md., built in 1850, the Starucca viaduct built by the Erie near Salamanca, N. Y., in 1848, and several arch spans on the Chicago & North Western near Shopiere, Wis., built about 1860. Of outstanding interest is the Starucca viaduct, a structure of 18 arch spans with a total length of 1200 ft. and a height of 110 ft.

*See Railway Engineering and Maintenance for November, 1926, page 462.

Dedicating the Southern Pacific's Suisun Bay Bridge on November 1

Capital Expenditures Highest Since 1923

CAPITAL expenditures of the Class I railroads of the United States for new equipment and for additions and betterments to railway property were larger in the first nine months of 1930 than for any corresponding period since 1923, according to an announcement made on November 20, by R. H. Aishton, chairman of the executive committee of the Association of Railway Executives. The announcement, which was made at New York in connection with the annual fall meeting of the member roads of the Association of Railway Executives, is abstracted below.

"Capital expenditures actually made in the first nine months of 1930 totaled $698,821,000, an increase of $125,001,000 or approximately 22 per cent above the same period in 1929, and an increase of $198,654,000 or 39.7 per cent above the corresponding period in 1928. The amount expended for capital account in the first three-quarters of 1930 exceeded by $69,728,000, or 11.1 per cent, the capital expenditures made in the first nine months of 1926, which, prior to this year, had been the greatest for any corresponding period since 1923.

"Of the $698,821,000 actually expended for capital account in the nine months' period this year, Class I railroads expended $272,825,000 for new equipment, while $425,996,000 were expended for roadway and structures.

"Among the expenditures for improvements to roadway and structures, the largest item was that for station and office buildings and other station facilities, which amounted to 69,340,000. This was an increase of $20,539,000 above similar expenditures made in the first nine months of 1929. For additional main tracks, the railroads spent $49,139,000, an increase of $4,870,000 above similar expenditures in the same period one year ago, while for yards and sidings, $38,465,000 were expended, which amount was a reduction of $7,827,000 under the preceding year.

"For heavier rail, the railroads so far this year have spent $40,215,000, compared with $33,995,000 in the same period one year ago. Expenditures for additional ballast in the nine months this year have amounted to $9,755,000, compared with $11,533,000 in the preceding year. Capital expenditures for bridges, trestles and culverts for the first three-quarters of 1930 amounted to $44,384,000. In the same period last year, $43,253,000 were spent for the same purpose.

"Capital expenditures actually made in the first nine months of each year beginning in 1924, when reports by quarters were first received, follow:

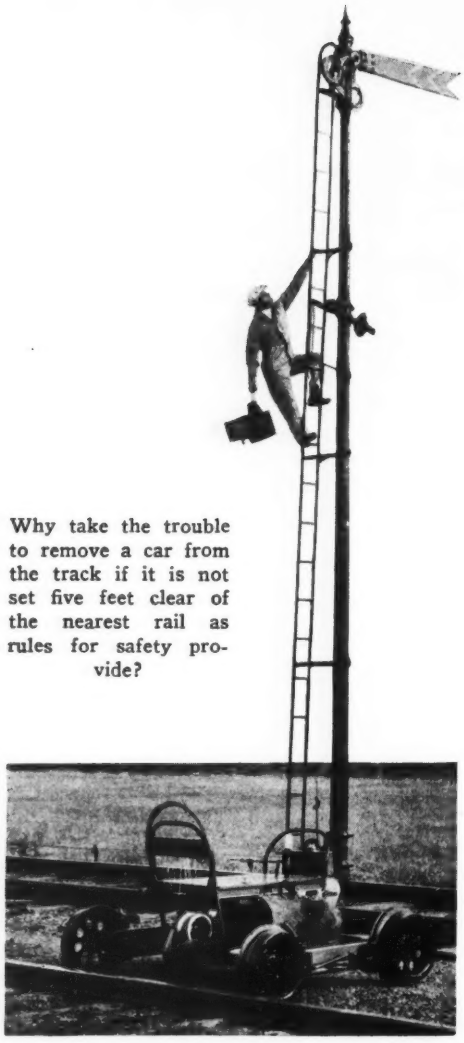
Date	Equipment	Roadway and Structures	Total
1924	$346,091,000	$264,813,000	$610,904,000
1925	255,893,000	279,141,000	535,034,000
1926	271,023,000	358,070,000	629,093,000
1927	204,992,000	365,223,000	570,215,000
1928	165,967,000	334,200,000	500,167,000
1929	210,689,000	363,131,000	573,820,000
1930	272,825,000	425,996,000	698,821,000

Operating Motor Cars Safely

Part III

Hauling trailers—Loading tools and materials—Handling gasoline—Operating rules†*

By C. R. KNOWLES‡



Why take the trouble to remove a car from the track if it is not set five feet clear of the nearest rail as rules for safety provide?

TRAILER CARS are used extensively in motor-materials, and have added greatly to the value of the car operation for carrying additional men, tools and motor car in maintenance work. At the same time, the operation of trailer cars has presented further problems in the control of accidents. Cars commonly used for trailers include old hand cars and motor car frames, wheels and axles, and push cars as well as cars designed especially for trailer service. Makeshift trailers with loose frames and worn wheels and axles increase the possibility of accidents. The condition of the trailer car is quite as important as that of the motor car itself, particularly in regard to the running gear, and the same attention should be given to its condition.

A properly constructed trailer car will not only reduce the hazard of accidents but will also decrease the cost of motor-car operation as compared with a makeshift trailer. No objection can be offered to the use of a push car for this service if the wheels, axles, axle boxes and other parts of the car are in good condition, but it should preferably be equipped with roller or sleeve-type bearings, as plain bearings throw an additional load on the motor car.

Frequent inspections should be made of all cars used as trailers to see that they are in good running condition. Cars with loose frames and axle boxes or worn wheels and axles should not be used for this purpose as this invites derailments.

It is desirable that trailers used for carrying men be provided with safety railings and brakes, and they should be so arranged that the men can be seated. Allowing men to stand upon a car while in motion or to sit with their feet hanging over the sides is bad practice and should be avoided.

Pushing a trailer or other car ahead of a motor car

*This is the eleventh of a series of 15 or more articles on the Care and Operation of Motor Cars, the first of which, on the Place of the Motor Car in Railway Work, appeared in the January issue, page 5, the second on the type of Motor Car, in February issue, page 54, the third, on the Motor Car Engine, in the April issue, page 158, the fourth, on How a Motor Car Is Built, in the May issue, page 214, the fifth, on Proper Lubrication, in the June issue, page 248, the sixth on Ignition, in the July issue, page 295, the seventh, on the Care of Motor Cars, in the August issue, page 339, the eighth, on How to Secure Efficient Operation from a Motor Car in the September issue, page 376, the ninth, on Motor Car Accidents, in the October issue, page 416, and the tenth, on Motor Car Accidents, in the November issue, page 482.

‡Mr. Knowles is in charge of the operation and maintenance of motor cars and other gasoline-operated work equipment on the Illinois Central System.

Trailers Must Be Attached by Approved Couplers

is dangerous practice, owing to the greatly increased liability of derailment, and under no circumstances must the trailer car be pushed ahead of the driving cars.

Many of the accidents that have occurred with trailer cars have been due to careless or faulty methods of coupling them to the motor cars, resulting in the trailer becoming uncoupled, causing it to derail or catch men between the cars. The coupler should be one that can be detached easily and at the same time not become uncoupled by accident. It should be so constructed that there is no slack motion between the cars, while it should not be stiff enough to cramp the wheels on curves or turnouts. The use of rope, chains or wire for coupling a trailer to a motor car is extremely bad practice.

Loading Tools and Materials

Many accidents in motor-car operation have been caused by the careless loading of tools and materials. The tools ordinarily used by section gangs, as well as such materials as bolts, spikes, etc., are carried on the car constantly, and it is important that they be properly placed in order to avoid accidents. Space should be provided on the deck of the car for each of these various articles so that they cannot fall off or come in contact with moving parts of the car. It should be an established practice that each article be placed in its designated position on the car. Guards should be provided at the front and rear ends of the deck or tool tray to prevent such tools as lining bars from working off the car. A middle western railroad has established the following rules as its standard method for loading tools:

Track Jack—Lay in a horizontal position (leaving jack handle socket up) on the rear right hand side of the car, as close to the center of the car as possible, with the base of the jack against the rear end of the platform.

Water Keg—Place at the rear of the car on a special steel hinged shelf provided for this purpose; see that keg is properly secured by placing the special metal band, provided for the purpose, around the upper part of the keg.

Level Board—Hang on the right hand side of the car in lugs provided for this purpose.

Sharp Edged Tools—Load on the boxed-in platform, in a safe and secure manner. Exercise care in placing them to prevent injuries to occupants of car.

Bars, Wrenches, Shovels and Small Tools—Place carefully on the boxed-in platform of the car so that no tools overhang the sides. When tools so placed pile up higher than the sides of the platform box, the foreman or man in charge will personally see that the tools are secured in such a manner that they cannot fall off while the car is in motion.

Bolts, Spikes and Tie Plugs—Section foremen will provide themselves with small square wooden boxes for the purpose of carrying necessary bolts, spikes and tie plugs on a motor car. It will not be permissible to load them in loose piles or at random on the motor-car platform.

General

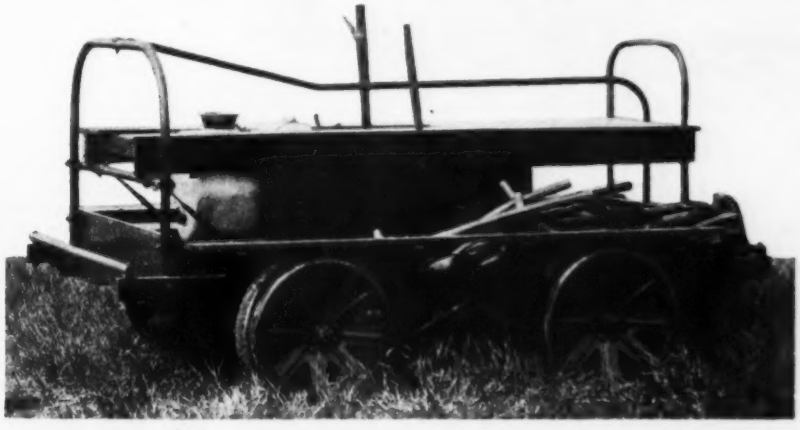
The proper protection of motor cars requires that they be equipped with adequate signal equipment, suitable for use both day and night. This usually consists of 2 red flags, 2 red lanterns, 2 white lanterns, 12 torpedoes and 6 fusees. All signal equipment should be kept in readiness for instant use. There should be a definite understanding as to its care as well as by whom it should be handled in an emergency.

Fusees should be carried in a rain-proof metal case to insure their being effective when needed.

The operator of a motor car should have a standard watch complying with standard time rules.

Torpedoes should be protected against accidental explosion by tools or from other causes. All torpedoes exploded by motor cars should be replaced.

Accidents due to motor cars catching on fire can be avoided by the proper handling of gasoline and by preventing leaks in gasoline equipment. Extreme care



Tools must be properly placed on a car—Proper loading shown at the left and careless loading illustrated on the right.

should be exercised in handling gasoline. Matches, torches or other open lights should not be used in the inspection of motor cars or when gasoline tanks are being filled.

Gasoline in excess of the regular supply in the fuel tank should not be carried on a motor car if it is possible to avoid it. If an additional supply is carried, it should be in approved safety cans painted red. State and federal laws regulate the transportation of gasoline on passenger trains, and when it is necessary to ship a motor car by train the gasoline tank should be drained.

Carbon monoxide fumes from the exhaust of gasoline engines are deadly and have caused many accidental deaths; therefore, motor-car engines should never be run inside tool houses, motor-car shops or other buildings unless the doors and windows are open.

The responsibility for motor-car accidents is divided equally between the operator of the car and the supervisory officer. While it is the duty of the motor-car operator to handle the car in such a manner that accidents do not occur, it is also the duty of the supervisory officer to see that the operator is capable and properly instructed as to the rules of safe operation, and that they are rigidly enforced.

Rules for Safe Motor-Car Operation

The following rules have been drafted to promote safe practice in motor-car operation:

(42) Motor cars must be used only for railroad business. None but employees in the discharge of their duties shall be permitted to use or ride upon cars except on proper authority.

(43) No one except a responsible employee who has been qualified and authorized will be allowed to operate a motor car upon the main track. So far as practicable, each motor car should be operated solely by one man who should be thoroughly familiar with the car and its operation. This employee shall be responsible for the proper use and condition of cars in his charge.

A Practice That Invites an Accident

(44) The operator of a motor car must have a standard watch and a copy of the current timetable.

(45) The employee in charge of a car must make a sufficiently careful inspection to know that the car is in condition for safe operation before using it. He shall report to his superior officer whenever the car is in need of repair or is in his opinion unsafe to operate. Immediately before starting on a trip the brakes must be tested to determine that they are in proper condition.

(46) A motor car must not be operated unless equipped with safety railings and front and rear tool guards.

(47) A motor car must not be operated outside of working hours other than in such emergencies as accidents, washouts, wire or signal failures, without authority of the division engineer or superintendent.

(48) In operating a car, brakes must be applied gradually and emergency stops made only when absolutely necessary. A greater distance is required to stop a motor car in wet weather when the rails are slippery, and the operator must take this condition into account and handle brakes accordingly.

(49) A motor car is to be used only for transporting men and tools. Heavy materials must not be carried except in emergency. Such materials as ties, rails, frogs, etc., must be transported on push or trailer cars.

(50) Tools and materials must be properly placed on a car to prevent their falling off. Track jacks must not be carried on the front end of the car.

(51) A motor car must not be overloaded. So far as practicable there should be a uniform method of placing tools on the car.

(52) On lines of more than one main track, a motor car should move with the current of traffic. Where there are separate tracks for passenger and freight service, a car should be operated on the freight tracks except in case of emergency or track inspection.

(53) A motor car must not be run through the spring side of frogs. The car must come to a full stop before passing over interlocked derails or switches. When a derail or switch is set against a car, it may be lifted over if safe to proceed.

(54) When approaching workmen on or near the track a motor car must be brought under complete control or stopped, as there is danger of some one stepping in front of the car, or of derailment by tools, spikes, stones or other obstructions on the rails.

(55) A motor car must be operated with special care when passing a train that is receiving or discharging passengers and must not be run between such a train and the station. The car must be stopped when practicable during the passage of a train on an adjacent track.

(56) When approaching highway or street crossings at grade, a car must be under complete control. Unless an unobstructed view can be had for at least 200 ft. in both directions along the highway or street, the car must be brought to a stop before proceeding across the crossing. If the crossing is protected by a flagman, the operator must secure a signal from him before proceeding.

(57) A motor car must not be attached to an engine or train; it must not be run closer than 500 ft. behind a moving train or stopped within 200 ft. of a standing train.

(58) Unless coupled, the space between two or more motor cars when running must not be less than 500 ft. A car in advance must not be stopped until the following car has been signalled. The employee in charge of cars so run must ride on the second car. When more than three cars are run they must be divided into groups of three or less, the front car of each group being run not less than 1,200 ft. behind the last car of the preceding group and each group being run as specified above.

(59) Hand and push cars should not be run with motor cars but if necessary they must be coupled behind. They should never be pushed ahead. The handles of hand cars should be disconnected when they are coupled to motor cars.

(60) When a trailer is pulled by a motor car it must be attached to the rear of the motor car by an approved coupler. Under no circumstances must a rope, wire, chain or other makeshift coupler be used. Trailers must never be pushed by motor cars, regardless of whether the motor is moving ahead or backward.

(61) Trailers used regularly for transporting men should be equipped with safety railings and brakes. Men must not be allowed to stand on trailers or to ride with their legs between the motor car and trailer.

(62) Employees operating cars on main tracks shall, when practicable, obtain information regarding trains, but such information will not relieve them from the responsibility for protecting their cars. They will see that their cars are clear of the main track for regular scheduled trains.

(63) When "blocked" by an operator or the dispatcher, a motor car operator must report clear when out of the block or clear of the main track. A car must be operated with the expectation of finding the main track in use, and care exercised to avoid striking other cars.

(64) The use of seats on the ends of motor cars, or seats not securely affixed to cars should be prohibited.

(65) There should be a thorough understanding as to the

Men must not be allowed to stand on cars or trailers or to ride with their legs between the motor car and the trailer.

part that each person on the car will take in handling the car, and as to the side of the track to which the car will be removed if an emergency should arise necessitating prompt action.

(66) Each man in a regular gang should be assigned to a place on the motor car where he will always ride.

(67) Scuffling or changing positions while the car is in motion should not be permitted.

(68) The men on the car must keep a sharp lookout at all times for approaching trains; for dogs, chickens, hogs or other animals, and for such objects as stones or sticks upon the rail that might cause a derailment. When two or more men are on the car, one man must face to the rear.

(69) Employees must not get on or off a moving car except when it is necessary to push it to start the engine.

(70) When it is necessary to push a motor car to start the engine, this must be done at the rear end of the car, and those pushing the car must get on at the rear end only.

(71) When the motor car engine is started with a crank, it must be pulled upward when the charge is being compressed in the cylinder to avoid injury to the person cranking the engine in case it should backfire.

(72) When a motor car is operated at night or during a fog, storm or snow or through tunnels, a white light must be displayed in front and a red light at the rear.

(73) A copy of the current timetable must be carried on a motor car, together with 12 torpedoes, 6 red fusees, 2 red flags, 2 red lanterns and 2 white lanterns. The fusees must be carried in a metal case. All signal equipment must be kept in readiness for instant use.

(74) A motor car must be removed from the track or protected by flag when not in use.

(75) Torpedoes exploded by a motor car must be replaced.

(76) When the view is obscured, during storms or fogs, or at night, special precautions must be taken, protecting the motor car by stop signals in both directions if necessary.

(77) When it is necessary to protect a motor car by stop signals, the car must wait until a flagman has reached a distance of one-half mile ahead of the car, after which the flagman and car shall proceed at the same speed. Upon the approach of a train, the flagman must place one torpedo on the rail on the engineman's side of the track and proceed toward the train, giving it a stop signal with a red flag, red light, or lighted red fusee, as required.

(78) A heavily loaded motor car or trailer that cannot be removed from the track quickly must be protected in both directions by stop signals, and must never be used in a storm, fog or at night unless absolutely necessary.

(79) When a motor car is removed from the track it must be placed not less than five feet from the nearest rail, and so located that it cannot foul the track. It must not be set off or left standing within the full legal width of a highway or private road crossing at grade, except in emergency. When necessary in clearing trains, a car may be set off at a crossing but it must be protected by an employee and removed immediately when the emergency is passed. It must be kept locked when not in sight of the men in charge, and at night and at other times when not in use.

(80) A motor car must be run with great caution at all times, and must never exceed the speed given in the following table for the condition and class of service:

Party inspection car	25 m.p.h.
Gang car in good condition, without tools	25 m.p.h.
Gang car in ordinary work	20 m.p.h.
Light center-load inspection car	20 m.p.h.
Gang car with trailers	15 m.p.h.
Side-load car	15 m.p.h.
All cars through station grounds	8 m.p.h.
All cars over frogs and switches	8 m.p.h.
All cars through interlocking plants	8 m.p.h.
All cars over highway crossings at grade	6 m.p.h.

(81) Section foremen and other employees who use motor cars must not run them beyond the limits of their assigned territories, except in such emergencies as accidents and washouts, without written permission from their superior officer.

(82) Matches, torches or other open lights must not be used in the inspection of a motor car or when the gasoline tank is being filled. The term "open lights" includes smoking. The engine of a motor car must not be allowed to run while the gasoline tank is being filled.

(83) Do not strain gasoline through a chamois skin as there is danger of the ignition of the gasoline through a spark caused by static electricity.

(84) Gasoline must not be carried in excess of the regular supply in the fuel tank except on such cars as have approved safety cans as a part of their equipment.

(85) When it becomes necessary to ship a motor car on a train, the gasoline tank and carburetor must be drained.

(86) A gasoline engine must not be run inside of a tool house, motor-car shop or other building unless the doors and windows are open.

Lumbering Operations on the Great Northern in Montana

Installs the Hot Process Treatment

THE elimination of pitting and corrosion, improved operation and a marked reduction in the cost of maintenance were the principal advantages resulting from the installation of the hot-process lime and soda-ash method of treating boiler water at the power house at the Chicago shops of the Chicago & North Western.

Owing to the increased demand for steam at this point, six 500-hp. water tube boilers were installed during 1926 and 1927 to supplement six 250-hp. water-tube boilers which are still being operated. Approximately 1,624,000 lb. of steam is generated daily during the summer months and 4,480,000 lb. daily during the winter months. The new 500-hp. boilers are equipped with an economizer section which raises the temperature of the feed water so that it enters the boiler ready to be generated into steam.

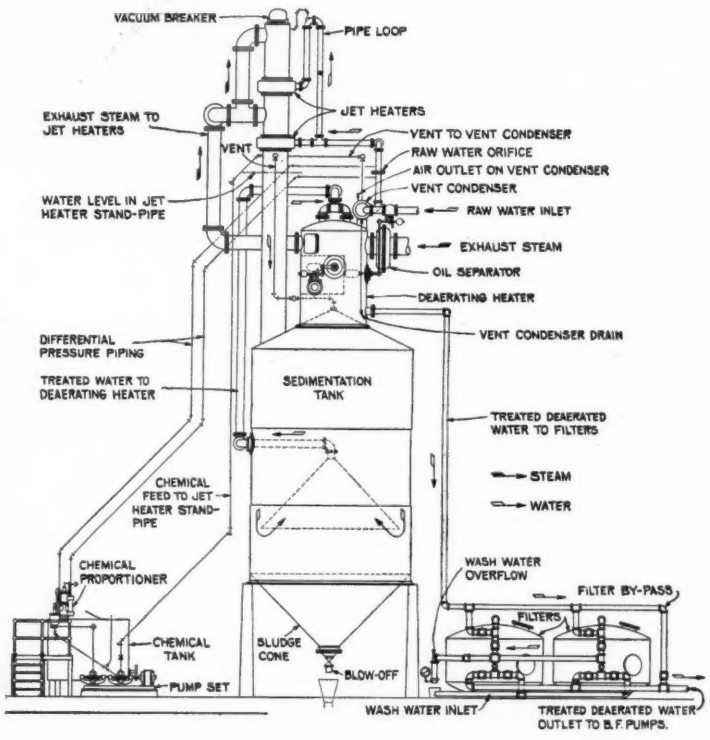
After approximately six months' operation of these new boilers, severe corrosion developed in the tubes and upper drum of the economizer section necessitating the complete removal of all tubes so affected. The water boxes, which extend through the firebox, became coated with calcium carbonate, which, under the high heat of the firebox, caused the boxes to crack. This was an unusual experience with the water from Lake Michigan, which contains approximately eight grains of calcium carbonate per gallon.

When these boilers were installed it was the intention to operate them continuously for from 60 to 90 days without washout, but, owing to the operating conditions, it was necessary to take one of them off approximately every 30 days for repairs.

Internal treatment was first tried in conjunction with the circulation of 25 per cent of the boiler water back through filters which were placed on the line from the boiler section to the entrance to the economizer section. The results obtained by this method were very disappointing, as it was impossible to maintain a constant alkalinity in the economizer section, while the concentration was built up in the boiler to such an extent that the combination of alkali with the suspended matter from the precipitated calcium carbonate caused the boilers to prime, and trouble was experienced in furnishing dry steam. Corrosion still continued and additional suspended matter appeared in the superheater tubes in the form of mud.

Install Hot-Process Softener

In April, 1928, a complete Cochrane hot-process water softener equipped with a de-aerator and a battery of quartz filters was installed. In this softener the make-up water, which is approximately 85 per cent of the total boiler-feed water in the summer months and 60 per cent in the winter months, is first heated to a temperature of 210 deg. F. by exhaust steam supplemented by live steam added automatically when necessary. The lime, soda ash and sodium aluminate are then added from the proportioner of the chemical tank and this mixture of chemical and water is allowed to flow downward, depositing the sludge upon the cone bottom, whence it is discharged from the plant by means of a quick-opening valve. The softened water, after one hour's reaction time, is then conducted into the de-aerator where it is heated to a temperature of 214 deg. F. under pressure. The gases escape through the vent of the de-aerator and the hot, softened water flows downward onto the quartz filters, whence the boiler feed water pump supplies it to the boilers. The



A Diagram of the Water-Softening Equipment

analysis of this feed water now shows calcium carbonate 0.5 gr. per gal.; sodium carbonate 1.5 gr. per gal.; and a slight trace of oxygen. The temperature at which the boiler-feed pumps force it into the boilers is 209 to 212 deg. F. The blow-down is now done twice in 24 hr. and the 500-hp. boilers, operating at a rate of 1,200 hp., require very little attention, being in excellent shape. These boilers now operate from 90 to 120 days between washouts and very little trouble is experienced with wet steam.

The tubes which were in service in April, 1928, are still in the boiler and economizer section without any indications of corrosion. The present water boxes have also been in service the same length of time. They, too, are in excellent shape.

A return storage or surge tank is also on the line for the storage of all of the return from heating system and the turbines. As this water is condensed steam or water that has already been through the softener, it is fed directly into the de-aerator and then onto the filters, together with what water is necessary from the softener to insure ample supply. This proportioning of make-up and return is all automatic so that it is not necessary for the engineer to give it much attention. We are indebted for the above information to R. E. Coughlan, supervisor of water supply, under whose direction the installation was made.

Track Prizes Awarded on the Pennsylvania

MANY supervisors on the Pennsylvania system, including the Long Island, received substantial rewards again this year as a result of periodical track inspections made throughout the year and annual inspections recently completed. The character and amount of prizes made this year on the three main regions and the New York zone were similar to those made during the last few years, as was also the method of conducting the inspections.

Results on Eastern Region

The principal, or "Klondike" prize, on the Eastern region, which is awarded to the main line supervisor's territory between Philadelphia and Altoona, Pa., and Philadelphia and Washington, D. C., which has maintained the best line and surface throughout the year, was won by Subdivision 33 of the Philadelphia division, of which L. E. Gingerich, Middletown, Pa., is supervisor, and C. B. McFarland, assistant supervisor. This prize amounted to $1,200, of which Mr. Gingerich received $800 and Mr. McFarland $400.

The prize for the greatest improvement made in line and surface on the tracks between the same main line points mentioned above, which amounted to $1,000, was awarded to Subdivision 81 of the Maryland division, of which G. A. Sawyer, Chester, Pa., is supervisor and P. M. Roeper, assistant supervisor. Of this prize, Mr. Sawyer received $700 and Mr. Roeper $300.

Two additional prizes of $800 each were awarded to supervisors and assistant supervisors maintaining the best line and surface on the two general divisions comprising the main line between Altoona and Philadelphia and Philadelphia and Washington, excluding winners of the Klondike and improvement prizes. These prizes, which amount to $600 for the supervisor and $200 for the assistant supervisor, were awarded as follows: F. H. Lewis, supervisor, and O. N. Essex, assistant supervisor, Subdivision 44 of the Middle division, at Huntingdon, Pa.; A. W. Preston, Jr., supervisor, and H. F. Webber, assistant supervisor, Subdivision 87 of the Baltimore division, at Washington, D. C.

Central Region

The "Klondike" prize on the Central region, amounting to $800, was awarded to D. E. Callahan, supervisor Subdivision 1, Eastern division with headquarters at Pittsburgh. The improvement prize, amounting to $700 to the supervisor and $300 to his assistant, was awarded to W. E. Baker, supervisor, and Festus Feeney, assistant supervisor, Subdivision 1, Panhandle division, at Carnegie, Pa.

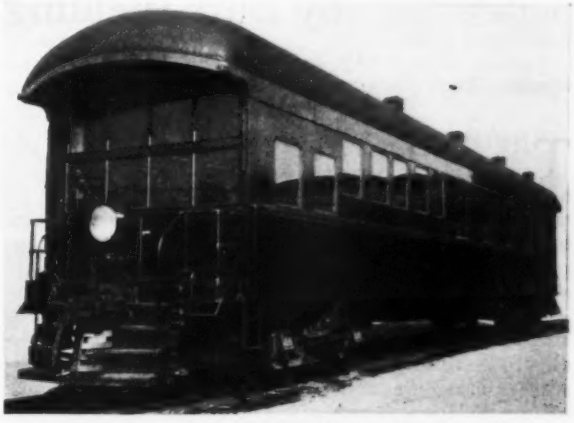
In addition to these main prizes, division prizes of $800, of which $600 went to the supervisor and $200 to the assistant supervisor, were awarded on each superintendent's division. The prize for the Pittsburgh division was won by C. H. Frick, supervisor, and T. F. Angus, assistant supervisor, Subdivision 11, at Derry, Pa. On the Panhandle division it was won by J. C. Dayton, supervisor and G. E. Ballard, assistant supervisor, Subdivision 5, at Newcomerstown, Ohio.

Supplementing the main line prizes, nine prizes of $100 each were awarded to the following nine branch-line supervisors in competition with each other on their respective divisions: C. F. Montague, Subdivision 13½ of the Pittsburgh division, at Pittsburgh, Pa.; H. J. Kerstetter, Subdivision 19 of the Conemaugh division, at Sharpsburg, Pa.; D. E. Rudisill, Subdivision 15 of the Monongahela division, at Uniontown, Pa.; F. A. Dever, Subdivision 4, of the Cleveland division, at Cleveland, Ohio; R. H. Meintel, Subdivision 1 of the Erie and Ashtabula division, at New Castle, Pa.; H. E. Conklin, Subdivision 1 of the Akron division, at Akron, Ohio; Carl McGhee, Subdivision 11 of the Buffalo division, at Struthers, Pa.; I. S. Pringle, Subdivision 8 of the Renovo division at Emporium, Pa.; James Foley, Subdivision A of the Wheeling division, at Wheeling, W. Va.

In addition to the prize awards made to supervisors, 57 prizes of $50 each were awarded to foremen who showed unusual excellence in the track conditions on their respective sections.

New York Zone

In the New York zone, which includes the New York division of the Pennsylvania and the Long Island, the $1,200 Klondike prize, was divided between F. P. Filipelli, supervisor, Subdivision 4, at Trenton, N. J.,



The Most Recent Type of Inspection Car on the Pennsylvania

and W. L. Steltzer, assistant supervisor at the same point. The improvement prize for the zone, which amounted to $400 to the supervisor and $200 to the assistant supervisor, was awarded to J. E. Vandling, supervisor, No. 3, at New Brunswick, N. J., and H. R. Lellande, assistant supervisor at New Brunswick. A prize of $100 awarded to the branch line supervisor having maintained the best track on the New York division, was awarded to J. L. Cranwell, supervisor, Subdivision 6, at Bordentown, N. J.

The so-called Klondike prize of $200 on the Long Island was awarded again this year to P. C. Smedley, supervisor, Subdivision 2, with headquarters at Jamaica, L. I. The second highest prize of $100 was awarded to F. T. Fish, supervisor, Subdivision 1, at Woodside, L. I., while the improvement prize, amounting to $100 was awarded to F. J. Nehrhoff, supervisor Subdivision 4, at Patchogue, L. I.

Western Region Awards

Following the annual inspection on the main and secondary lines of the Western region, cash prizes totaling $3,900 were awarded for the best track on the various subdivisions. The Klondike prize of $800 awarded for the best line and surface on any main-line subdivision went to Philip O'Connor, supervisor of Subdivision I of the Ft. Wayne division at Crestline, Ohio. The prize of $700 for the greatest improvement during the year was awarded to R. H. Riser, super-

visor of Subdivision I, Cincinnati division, Xenia, Ohio. Prizes of $600 for the best line and surface on main line divisions were awarded to Delphi Lewis, supervisor of Subdivision 4, Columbus division, Richmond, Ind.; M. E. Boyle, supervisor of Subdivision 3, St. Louis division, Greenville, Ill.; and Allen F. Roper, supervisor of Subdivision 2, Cincinnati division, Morrow, Ohio.

Six prizes of $100 each for maintaining the best line and surface on secondary lines were also awarded to the following supervisors: Gust Evert, Subdivision B, Logansport division, Logansport, Ind.; H. W. Thompson, Subdivision 1, Toledo division, Toledo, Ohio; D. Horgan, Subdivision 3, Grand Rapids division, Cadillac, Mich.; T. B. Greene, Subdivision 6, Cincinnati division, Hamilton, Ohio; Henry Hoge, Subdivision 1, Indianapolis division, Louisville, Ky.; and George L. Bartels, Subdivision 4, St. Louis division, Decatur, Ill.

Lengthening Rails by Butt Welding

By L. C. Ryan
Manager Track Department, The Oxweld Railroad Service Company, Chicago

THE STATEMENT has frequently been made, and supported by accurate data, that battered rail ends are responsible for the removal of 85 per cent of all the rail which is renewed. It is said further that joint maintenance constitutes one of, if not the most, important expenses incurred in maintaining track in safe and serviceable condition.

The rail joint, being the weakest point in the track structure, is responsible, in greater or less degree, for all of the troubles and expense to which track is subject. Before the rail ends begin to show appreciable batter, the joints, even with a high standard of maintenance, are a prolific cause of trouble. Under traffic this weak point in the track structure begins to fail first, resulting in the rolling and nosing of passing equipment. Such train action causes the track to deviate from correct alinement and surface. The first action taken by the maintenance man is the tamping up of the low joints. This results in increased rigidity at the joint and sooner or later calls for the resurfacing of the entire stretch of track in order to preserve the riding qualities.

Butt Welding Rails for Track Along Platform

Over a long period of years, engineers have devoted their best efforts to the development of devices and methods which would improve the connection between one rail and the next, would decrease the excessive wear on rail ends and connections, and would effect economy in their maintenance. In spite of all the improvements which have been made, the rail joint still maintains its position as the leading trouble maker in track construction. Obviously, the only complete solution of the problem is the elimination of the joint.

Length of Rails Being Increased

In order to eliminate as many joints as possible, railway engineers in recent years have gradually, but cautiously, increased the length of rails from the original 30-ft. rail to 33 ft., to 39 ft. and later, in some few cases, to 66 ft. The performance of these longer rails in track has been watched very closely and from all reports nothing but advantage has been gained from every step in the direction of longer rails.

The Rails Were Butt Welded Through This Station

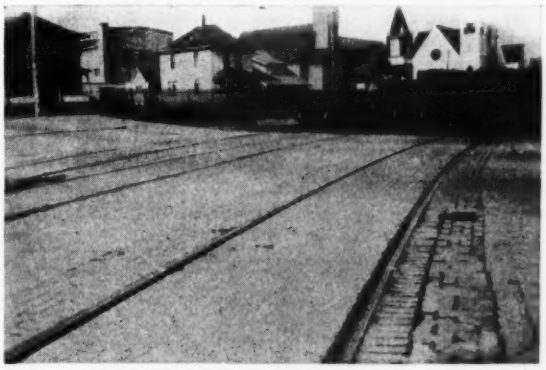
It was feared at first that trouble would be experienced in taking care of contraction and expansion, due to temperature variations, in the longer sections of rail, but experience has proved that 66-ft. rails can be laid with the same expansion as 33-ft. rails without causing the least difficulty. However, there is obviously a limit to the length of rail which it is practicable to roll at the mills and there is also a limit to the length of rail which can be handled advantageously in laying track. While it has been demonstrated that 66-ft. rails can, with proper equipment, be laid at less cost than 33-ft. rails, it is apparent that any great increase beyond 66-ft. would introduce problems of transportation and handling which would be insurmountable.

The 66-ft. rails require only half as many joints to the mile as 33-ft. rails, but while their use effects a corresponding reduction in the cost of joints and would materially improve the riding qualities of the track, there would still be present in the track joints of the same character as those that are now subject to batter and which are responsible for premature rail renewals. The effect of adopting the 66-ft. rail would, therefore, be merely that of reducing the cost of maintaining the joints in the same ratio that the longer rail bears to the shorter.

It is evident, that to realize the full advantage of joint elimination, the length of rail must be extended far beyond the limitations imposed by mill and rail-laying operations. The method which promises the ac-

*Presented at the fall meeting of the American Welding Society at Chicago, on September 26.

complishment of this desirable result is the butt welding of rails. By this method, which has been in process of development over a period of years, it is possible to butt weld rails in track under traffic without interference with trains and at a cost which is infinitesimal as compared with the advantages to be secured. Until the present time most of the butt welding which has



The Rails in this Crossing Were Butt Welded

been done under the supervision of the Oxweld Railroad Service Company has been applied to rail in tunnels, through road crossings and station platforms, on cinder-pit and scale tracks and in similar locations where the maintenance of mechanical joints has been particularly difficult and expensive. The success of the work so far accomplished is attested by the fact that the butt welding of rails has increased more than 2,000 per cent during the last five years. The results secured from the work already done furnish conclusive proof of the feasibility of extending the length of rails by the butt-welding procedure and I believe that the time has now arrived when the railroads should take full advantage of the possibilities of this process by extending it to rails in open track.

Progress has reached a stage where butt welding is no longer an experiment. The work which has been done in this country speaks for itself and, if further evidence of the feasibility of connecting long stretches of rail is required, reference may be had to German practice where stretches of rail upwards of 1,000 ft. in length have been welded together with highly satisfactory results. It has been demonstrated conclusively by the Germans that the problem of expansion and contraction may be ignored in its relation to long stretches of welded rail. The German engineers, whose thoroughness in such investigations is well appreciated, have found that all of the expansion and contraction resulting from temperature changes is confined to approximately 40 ft. at the ends of any length of rail.

Life of Rail Would Be Lengthened

Much has been accomplished during recent years to lengthen rail life by building up battered and chipped rail ends by the oxy-acetylene welding process. But even under the highest standards of maintenance, wherein battered joints are built up as soon as they begin to show serious wear, there must be extended periods during which the riding qualities of the track are not 100 per cent and during which there is excessive wear upon the mechanical connections owing to the slight batter which must exist for some time before it becomes serious enough to justify building up.

The use of this process of building up joints has saved the railroads many hundred millions of dollars, but still falls short of the promise of economy held out by the procedure of butt-welding rails to eliminate the joint entirely. The entire elimination of the joint would, evidently, produce a track on which no batter occurs, so that the present expense of building up and of maintaining joints and of repairing equipment worn and damaged by reason of roughness caused by worn joints would be entirely eliminated from railroad operating expenses. Furthermore, the butt-welded rail joint will eliminate rail creeping and provide a perfect conductor for signal currents without the use of bonds.

W. P. Puts Harmony in Standard Colors

By Colonel J. W. Williams
Chief Engineer, Western Pacific, San Francisco, Cal.

ALONG the line of the Western Pacific and its subsidiaries are many buildings that were erected at various periods in the history of the properties and of various types of architecture. They range from the smaller fuel sheds through groups of section buildings up to important station buildings. Their architecture is as varied as their use.

In connection with the improvement program now in progress on this road the planning of new standards for section buildings was undertaken, and a consulting architect was employed to develop housing standards

Top—An Operator's House Painted According to the Old Standard. Bottom—An Agent's House Showing How Those Parts Formerly Trimmed Are Painted "Into the Body"

for employees, which would be practical and attractive as well as economical. Out of the discussions which centered around the development of building standards came the thought that a standard might be created which would bring all of the miscellaneous buildings on the system into one harmonious whole. Obviously, this could not be done by remodeling all of the buildings on the system, so the thought turned to paint.

With the belief that the public forms its opinion of a railroad largely by what it sees, the selection of paint

standards which would help to weld these miscellaneous structures into an attractive entity was undertaken. Every structure, from the minor buildings to the finest passenger station, leaves its visual impression on the traveler. A fine ticket office leaves the impression of fine equipment and fine service and the fact that there are many more small buildings than large, impressive ones, makes it more necessary to make the smaller ones attractive.

In the selection of the paint and color standards for the Western Pacific properties, it was necessary to accomplish three things: (1) The colors must be durable for economic reasons; (2) they must be "standard" colors in order to be easy to mix; (3) they must harmonize with their environment and be attractive.

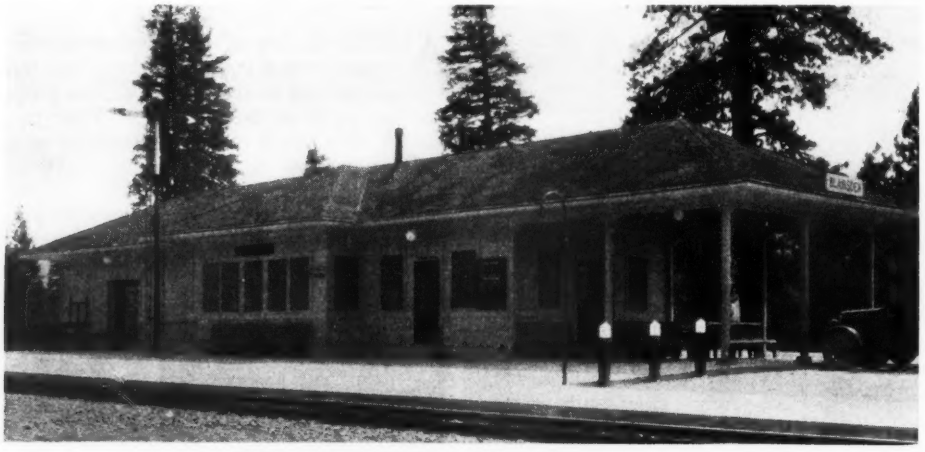
"Graystone" is a warm attractive gray, leaning toward buff. It merges well with the landscape and makes an ideal combination with the green of trees and hills. It was adopted as the general body and trim color for the outside of all painted buildings. "Graystone" shows less soil than most light colors, blends with almost any type of landscape and is pleasing to the eye.

Paint Trim "Into the Body"

The casings, corner boards and miscellaneous trim, which are ordinarily painted a color contrasting strongly with the body color, are now "painted into" the body of the building. Small buildings which used to fairly stagger under their load of trim colors are now unobtrusive parts of a whole. To relieve possible monotony, it was decided to paint the sash and doors (not the trim), as well as the shingled roofs, an "iron brown." This color harmonizes perfectly with the body color and keeps free of finger marks on the doors around the knobs. Painting only the doors and sash in this color gives just the needed relief.

"Battleship gray" is the most durable and clean color for floors that is available. It wears splendidly and shows foot marks less than any other color. It is the standard for all exterior floors and for all interior floors not otherwise covered. Inside, all painted walls are done in "washable ivory," the ceilings in "washable cream," and the doors, sash, trim and wainscot in "washable buff." These three colors are all from the same family. They blend perfectly and give a light, cheerful appearance to a room.

For the interior of smaller buildings, such as motor-car houses, tool houses, coal houses, pump houses, scale houses, telephone booths, interlockers, etc., cold water white is used. It is cheap, easily applied and fresh looking. Radiators are done in aluminum bronze.



The Station at Blairsden Painted to the New Standard

Only nine colors are used in the complete set of standards.

A book of paint standards has been compiled, giving the combination of paint to be applied to various classes of buildings. The following, which is the paint standard for section houses and similar buildings used as pumpers' and maintainers' dwellings, is an excerpt from the book of standards:

Exterior	Color
Body	Graystone
Trim	Graystone
Sash, doors and roof	Iron brown
Porch ceilings	Graystone
Porch floors	Dark battleship gray
Interior	
Walls	Washable ivory
Doors, sashes, trim and wainscot	Washable buff
Ceilings	Washable cream
Floors, not covered	Dark battleship gray

The Railway Industry at a Glance

Operating revenues and expenses of the Class I steam railways in the United States, from data compiled by the Bureau of Statistics, Interstate Commerce Commission

	Month of September			Nine Months Ending with September		
	1930	1929	Decrease 1930 under 1929, per cent	1930	1929	Decrease 1930 under 1929, per cent
Total operating revenues	$467,468,612	$567,364,918	17.6	$4,082,725,729	$4,781,684,237	14.6
Expenditures for maintenance of way and structures	**59,208,558**	**77,687,389**	**23.8**	**561,981,414**	**656,884,227**	**14.4**
Total operating expenses	320,131,009	383,858,627	16.6	3,052,543,100	3,419,397,034	10.7
Net railway operating income	104,078,329	134,345,888	22.5	659,427,561	962,854,453	31.5

Install

Flaw Detector

at Rail-Sawing Plant

Pennsylvania uses device at Verona, Pa., to insure integrity of reconditioned units returned to the line for further use

Making a close check of suspicious rails with a portable galvanometer

SUPPLEMENTING the operation of the Sperry rail-flaw detector over its tracks, the Pennsylvania railroad has placed a stationary unit of detector equipment in the large rail-sawing plant at Verona, Pa., at which practically all of the cropping of worn rail is done for the Central region. By the use of this equipment every rail, as it passes through the Verona plant, is tested throughout its length for defects and when sent back on the line for reuse, it is, therefore, insured as being as structurally sound as is possible with the most modern equipment available.

Description of Equipment

The rail-testing equipment, which was installed at the Verona plant in March of this year, differs in many respects mechanically from the Sperry detector equipment mounted for movement over the rails in track, described in *Railway Engineering and Maintenance* for December, 1928, but the principle employed is fundamentally the same. Briefly, defects are detected by forcing a heavy uniform current through the rail and then passing a specially designed electrical instrument over the head of the rail, in close proximity to it, which is designed to detect changes in the amount and direction of the magnetic flux about the energized rail which occur wherever interior or surface defects are present.

The stationary equipment, which gives indication of defects in the rails by the flash of a Neon lamp on a detector sled in the hand of the operator, is much more simple than the equipment mounted for use on the track, which is designed not alone to detect defects, but also to mark their location on the rails and to establish a permanent record of the conditions found. Essentially, it consists of a motor-generator set to force the current through the rails being tested, electrical contact rail clamps for cutting the rails into the electric circuit, a detector unit for movement over the head of the rail in ascertaining its condition, and such auxiliary electrical equipment as storage batteries, amplifiers, relays, etc.

The use of the flaw detector at the rail-saw plant forms a distinct and separate step in the work at the plant, but it has been so planned and scheduled that it in no way interferes with normal rail-sawing operations. The entire equipment and testing operations are confined solely to the building unit of the plant housing the incoming rail skids, and the tests of the rails are made as they are moved laterally over the skids to the roller bed which feeds the friction rail saw.

Two rails are segregated and lined up for test at a time, with their heads up, directly in their line of movement over the skids. Directly above the point of testing are the electrical contact rail clamps, which, with their power-cable connections, are counterweighed so that they rise to a position overhead automatically when not clamped on to the rail.

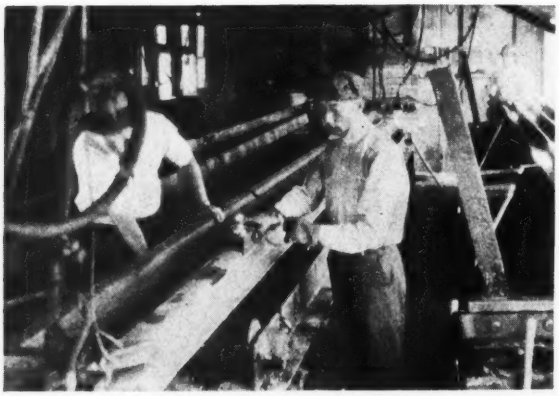
There are four rail clamps in the equipment, two at each side of the rail skids, so that contact can be made with the ends of the two rails to be tested at each set-up. The clamps at opposite ends of the rails are operated in pairs, so that entirely independent circuits are made through the two rails. The purpose of lining up two rails for test at a time and providing the electrical contact equipment in duplicate necessary under this arrangement is to enable the detector operator to test one rail as he moves forward across the skids and a second rail as he comes back to his original position.

The clamps used are specially designed units with hand grips, electrical contact points and air-operated plungers which give the clamps a firm grip over the rail heads. Through the hollow castings of which the bodies of the clamps are made, a small stream of water is passed constantly for cooling purposes, the water being fed to the clamps and carried off in flexible rubber hose lines which are counterweighed with the clamps themselves. Cooling of the clamps is necessary because of the heating action set up by the resistance in the electrical circuit at the contact be-

tween the clamp contacts and the rail, and the arcing at the contact points, which is produced intentionally at times in adjusting the clamps to secure positive contact. Air for the operation of the clamps is furnished by an electrically-operated air compressor unit, which supplies air at pressures ranging from 85 lb. to 125 lb. per sq. in.

Flashing Light Indicates Defects

The detector unit of the equipment is in the form of a small hand-operated sled, which is pushed over the surface of the rail head by the operator. This sled, which contains suitable coils for detecting any changes in the intensity or direction of the magnetic flux about the rail, rides on four non-magnetic runners so that there is no actual electrical contact between the rail and the sled. On the other hand,



Interior of the Skid Room Showing Operator Testing Rail With the Detector Sled

the runners afford a bearing for the sled and insure a constant relation between the electrical elements of the sled and the rail head.

The types of defects found with this equipment correspond with those found with the car-mounted detector equipment and include fissures, pipes, occlusions and shattered zones, and such surface deformations as driver burns and hammer blows. The change in the magnitude or direction of the flux about the rail caused by any of these defects sets up an induced current in the circuit of the detector sled, which, after amplification, is brought back to operate a small ½-watt, 125-volt Neon lamp mounted on the top of the sled. Thus, flashes of the Neon lamp, and the intensity of the flashes as the sled is moved over the rail head at a walking speed, indicate the precise position and magnitude of the defects encountered. It is said also that the character of the glow of the Neon lamp has a direct bearing on the particular type of defect encountered.

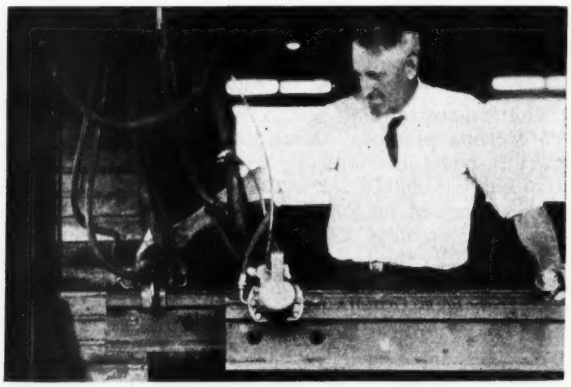
All wire connections to the detector sled are suspended from a trolley arrangement overhead, and are of such lengths as to permit free movement of the sled throughout the lengths of the rails. All power cables to the rail clamps are also carried overhead so that the movement of the detector operator and other men about the plant is not obstructed by the equipment in any way.

A small office unit adjoining the incoming rail room, about midway its length, houses an instrument table with such instruments as amplifiers, relays, switches, etc., and also the storage batteries used in the amplified detector circuit. The motor-generator set, which furnishes current of 2,000 amperes at 12 volts for the rail circuits is, at present, located in a small shed adjacent to the incoming rail room, opposite the office, and the air compressor supplying air to the rail clamps is located within the skid room proper, near the office or amplifier room. In the final arrangement proposed, all of this equipment will be grouped together outside of the rail-receiving room in a new building unit in line with the office unit.

Actual operation of the detector equipment at the rail-saw plant is carried out by one man, the detector sled operator, and two helpers who pull the incoming worn rails down over well-greased skids into position for testing. The point of testing is about five feet back from the roller bed leading to the rail saw. At this point an aisle was cut through the skid rails and their supports to permit the detector operator to move along the rails. Special counterweighted steel arms span the gap at each skid rail when rails are being moved down the skid, these arms being forced down to form links in the skid rails as the rails are pulled down. As soon as a rail has been moved off from the arms, they lift up out of the way in much the same manner as the leaf of a bascule-type bridge in opening. The point of testing is immediately alongside the lower side of the gap in the skid rails so that the detector operator can walk the full length of the rails and directly alongside them.

As two rails are pulled into place they are righted, if they are not already in that position, and the helper at each end pulls down the electric contact clamps and fastens one over the head of each rail near the end. An ammeter on the wall at one end near the original position of the detector operator shows when full current is passing through the rails. If the clamps have been adjusted and the ammeter does not show the normal full flow of current, it is an indication of poor electrical contact at the clamps. This is overcome by simply jolting the clamps, causing arcing at the contact points sufficient to burn clean points of contact in the head of the rail.

As soon as it is seen that the rails are properly in the electric circuit, the detector operator moves the detector sled along the head of the nearest rail, pro-



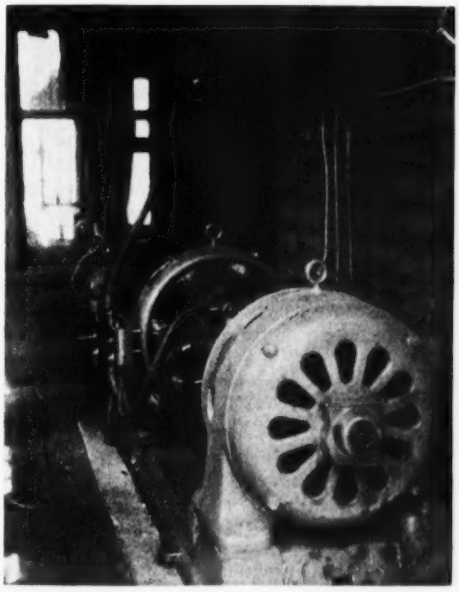
Adjusting the Electrical Contact Clamps on the Rails Being Tested

ceeding throughout its length uninterrupted at a steady walking pace, unless there is a flash of the Neon lamp mounted on the back of the sled. If no flash occurs, it is an indication that the rail is clear of defects and the operator, on reaching the end, shifts the sled to the other rail lined up and tests that rail on his return to his starting position.

Owing to the sensitiveness of the detector and its ability to pick up even minor surface blemishes on

the heads of the rails, with accompanying flashes of the Neon lamp, it has been found from actual practice that a great deal depends upon the operator, requiring that he be not only fully experienced in the handling of the equipment itself, but that he must have also proper experience and knowledge in connection with rail defects and rails in general, and in interpreting the character of defects or blemishes indicated by flashes of different character and intensity. The subdued light throughout the room where the tests are made aids materially in the interpretation of the flashes.

At each flash of the Neon lamp, the detector sled is stopped and moved back and forth over the point of flash to study the character of the flash. This is



The Motor-Generator Set Used to Saturate the Rails With Current

followed by an examination of the rail head for burns, dents, rough spots and similar defects, and if such surface blemishes are apparent, and the character and intensity of the light do not indicate a defect other than can be seen on the surface of the head, the operator moves on, disregarding the flash unless the surface blemish found is sufficiently bad to warrant discarding the rail. If a flash of the lamp and inspection of the rail indicate an internal defect, that rail is regarded as suspicious and pushed off the skids lengthwise, through an opening in the end of the building, out into the open, where it is held for more minute inspection later with a galvanometer.

Special Rail Clamps Are Used

All suspicious rails are segregated in this manner for detailed testing later so as not to slow up the normal rate at which the detector tests must be made in order to keep up with the movement of the rails to the saw. This is true particularly in the layout described, because adaptation of the Verona plant for the use of the detector, without making major alterations, did not permit sufficient room between the point of testing the rails and the roller bed to the saw to provide for an adequate reservoir of tested rails. It is necessary, therefore, in order to avoid holding up the saw, to set out all suspicious rails for further test later, and to continue routine testing with the detector while the saw is in operation. Ordinarily, no difficulty is encountered in this respect, since it requires an average of only 30 to 40 seconds to test two rails, while considerably in excess of this length of time is required to make the cuts at both ends of these rails.

During intervals when the rail saw is not in operation, any suspicious rails which have been set out are brought back into the plant over the roller table provided and are given minute examination at the points of suspicion with a portable galvanometer. This electrical unit is equipped with a wire connection to two contact fingers which the operator moves along over the head of the rail to determine the exact point at which the electrical disturbance occurs in the rail, and to ascertain as closely as possible the extent and cause of the disturbance.

If the galvanometer test does not bear out the suspicious indication of the detector sled, and the flash of the Neon lamp is determined to have been caused by some unobjectionable surface defacement, the suspicious rail is given a revised grading and is sent on to the rail saw. On the other hand, if a rail is proved defective by check with the galvanometer, and especially if the defect is of the transverse fissure type, it is immediately branded as a transverse-fissure rail. In certain cases these rails are broken to establish the finding definitely and to permit detailed study of the failure and the relationship between it and the character of indication given by the detector equipment. A definite record is made of the brand, date of rolling and heat number of any rails disclosing transverse fissures, so that other rails of the same heat in the track may be watched carefully for signs of defect.

Without definite knowledge that the detector equipment is missing certain defects in the rails, either consistently or intermittently, owing to the character of the defects themselves or the manner in which the detector is operated, and in view of the actual findings made thus far with the equipment, it is felt that the detector is producing effective results. Greater confidence is not only placed in the rails sent back to the track, but having been tested at the plant

Interior of the Office Showing the Amplifier Table With Its Cover Raised

there is not the urge, which might be felt otherwise, to test the rails with car-mounted detector equipment immediately after they have been relaid in the track.

The installation of the Sperry detector at the Verona plant and its operation have been carried out under the direction of J. B. Baker, chief engineer maintenance of way of the Central region of the Pennsylvania, while the actual operation of the equipment has been under the direct supervision of J. E. Wilson, assistant supervisor of telegraph and signals.

Many Uses for Truck-Crane at City Terminal

Pennsylvania employs machines to marked advantage at Philadelphia

HANDICAPPED by conditions which made work-train operation slow, expensive and, in many cases, practically impossible, the Philadelphia Terminal division of the Pennsylvania has, since early last summer, been employing with unusual effectiveness and economy, a truck-crane in a wide range of maintenance work in and about Philadelphia, Pa. This new unit of equipment, which consists essentially of a 7½-ton crane mounted on a special heavy capacity truck having a six-wheel chassis, can be moved readily over city streets without interference with, or interruption by, train or car movement. As a result of its use, work-train expenses have been cut and delays in getting work under way have been greatly reduced.

Conditions on the Philadelphia Terminal division, and especially on the supervisor's territory to which the crane is assigned, are particularly favorable to the maximum effectiveness of such a unit, for on this territory, which embraces South Philadelphia, there are over 22 miles of track in paved streets.

With both heavy rail and street traffic, work trains were impractical and expensive for carrying out many classes of heavy maintenance work, but in the absence of other better suited equipment had to be relied upon to a large extent. In the first place, getting the work trains to the jobs involved loss of time and delay to the work, as is seen by the fact that even under favorable traffic conditions, it required about two hours to move a work train from the South Philadelphia engine terminal to many points on the subdivision.

The impossibility of tying up a track for any length of time was another disadvantage of the work train; still another factor against the work train and in favor of a unit capable of movement clear of the tracks was the fact that frequently the services of a crane were urgently needed when a work train was either unavailable or tied up by traffic. A common example of such cases was the necessity for removing rails, frogs, ties and other heavy track materials from the city streets immediately after they have been renewed, or at the end of the day, an operation which is considered most important both from the standpoint of safety to street traffic and to guard against theft. Frequently, too, new material in cars at a job could not be reached by work-train equipment, interfering seriously with the progress of the work.

Features of the Truck-Crane

The truck-crane on the Pennsylvania consists of a gasoline-operated, full-circle excavator equipped with a 25-ft. lattice boom, mounted on a special heavy capacity truck having a four-cylinder engine and a six-wheel chassis. The most unusual feature of the excavator, or crane, is the fact that it was designed specially in many details, employing the use of alloy steel wherever practicable in order to minimize its weight, and, thereby, the weight of the truck-crane assembly as a whole. As a result, the total weight of the unit is 36,000 lb., within the legal maximum gross load limit established by the city.

Auxiliary equipment on the truck-crane assembly includes forward and rear outriggers and a winch; the forward outriggers consisting essentially of two I-beams mounted transverse to the truck frame, which can be extended to either side of the truck, while the rear outriggers are adjustable arms attached to the sides of the truck frame, which can be swung out over the rear set of wheels in such a way as to transfer an excessive load on the crane directly to the rear wheels, rather than through the chassis springs. The rated load capacity of the crane at different radii of boom swing is 4,200 lb. at 25 ft.; 5,500 lb. at 20 ft.; 8,300 lb. at 15 ft.; and 15,000 lb. at 10 ft.

The hoisting equipment used with the crane includes a ½-yd. digging bucket, a 1½-yd. snow bucket, a hook, rail and tie tongs and special sling chains for handling scrap or rails or ties in quantity. Changing from bucket to hook attachment requires about one-half hour, while the reverse operations require from 1 to 1½ hrs.

The Truck-Crane Equipped with Rail Tongs Loading "Fit" Rail

Arranged for transit, the crane boom is swung forward over the right half of the driver's seat and is chained in this position as positive insurance against excessive side sway. The speed made by the truck-crane in transit varies with the condition of the pavement up to a maximum speed of about 20 miles an hour. Ordinarily, it is operated at a speed of about 13 miles an hour.

Since the purchase of the truck-crane by the Pennsylvania it has been kept busy constantly in a wide

Grading for an Industry Track with the Truck-Crane

range of maintenance operations, including the handling of new, fit and scrap rails and frogs, switch timbers and crossties; the loading and unloading of such bulk materials as stone, cinders, screenings, coal and small scrap; and excavation in connection with such work as ditching, grading and the installation of under-track drains. In relaying rails in paved city streets, where girder rails of 159-lb. and 174-lb. section are used, the crane has been found particularly effective, handling the rails singly into and out of the track. Ordinarily, in handling scrap rails which have been piled by the section forces, a number of rails are lifted at a time by employing a sling chain. Ties are also handled in groups, the usual load including about 30 ties. Scrap is handled with either chains or one of the buckets, depending upon the character and quantity of scrap to be handled.

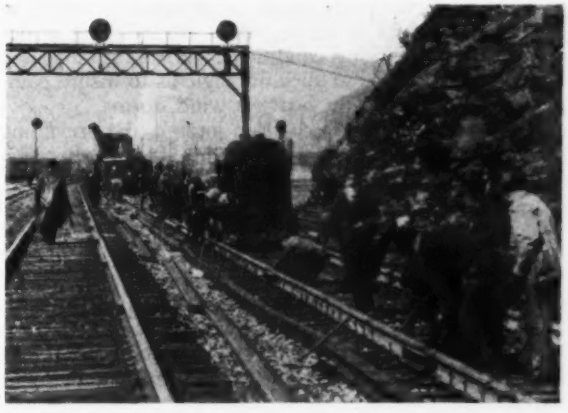
In addition to the more common uses made of the 1½-yd. bucket with which the crane is equipped, it has been used effectively in the mixing and handling of bituminous paving materials for use in repairing or resurfacing the pavement about the tracks, for which the railroad is responsible. In this work the crane first unloads about three cubic yards of stone aggregate from a car, and then, after the bituminous binder has been poured over the batch, it picks up and drops the mass repeatedly until the material is mixed thoroughly. It then loads the material into wagons to be hauled and distributed at the points requiring repair.

Another rather unusual and effective use is made of the bucket equipment in loading rubbish which has accumulated on the right-of-way. Collecting of the rubbish, which is quite considerable on certain sections, is done by the section forces who pile it near street crossings, under overhead highway bridges, or at other points within reach of the crane for loading into dump wagons.

The digging bucket has been used in ditching and drainage work largely where this work could be reached from a roadway, but in one instance thus far the equipment was used effectively in grading for a 700-ft. industry track. In this instance the fill, which was to be about 18 ft. wide and of an average depth of 18 in., was made entirely from borrow alongside, within reach of the crane bucket. The truck-crane moved backward over the fill as completed on a corduroy-like road built of old ties, about 50 ties being required to keep the roadway under and in advance of the crane. Operating in this way, about 100 ft. of track was completed a day, involving the handling of about 350 cu. yd. of fill.

In addition to these uses which have been made of the truck-crane, it has been used in spotting cars and in dragging cinders, the winch in front of the crane being used in the latter case because of the increased pull required over that of moving a free rolling car. The crane has been used also for unloading structural steel moved as revenue freight and is of sufficient size to handle containers employed in container-car service. With the approaching winter it is expected that the equipment will be effective in loading snow which has been plowed from the tracks, using the 1½-yd. bucket in this work.

The usual force employed with the crane includes only the truck driver and the crane operator, although, in some classes of work where unassisted by section forces, two laborers are also employed. Operating on the basis of the truck driver and the crane operator only, and including all other charges such as fuel, interest on the investment, depreciation and repairs, it is costing approximately $30 a day to keep the crane in service.



Laying Rail on the Pennsylvania

WHAT'S THE ANSWER?

Have you a question you would like to have someone answer?

Have you an answer to any of the questions listed below?

QUESTIONS TO BE ANSWERED IN THE FEBRUARY ISSUE

1. *To what extent should the section forces be required to classify scrap before shipment?*

2. *What methods should be followed in shimming track to minimize the spike-cutting of the ties? What differences in methods are necessitated where tie plates are used?*

3. *Under what conditions, if any, should rails be double spiked? Should the double spiking be on the inside or the outside of the rail? Why?*

4. *When laying cast iron pipe, what precautions should be observed to minimize the danger of later service breaks in the pipe and to insure that the line will function properly in service?*

5. *What benefits, if any, are derived from requiring the section foreman to walk over his section? How often should he do this?*

6. *What satisfactory method can be employed to test the bearing power of foundation piles?*

7. *What methods can be employed to protect against sewer gas when inspecting sewers?*

8. *What are the relative advantages and disadvantages of steam and drop hammers for driving concrete piles?*

Erecting Snow Fences

What is the best method of erecting portable snow fences in cases where they are placed on cultivated land and must be removed early in the spring while still surrounded by deep drifts and the frost is still in the ground?

Should Be Designed for Easy Dismantling

By G. STAFFORD
Section Foreman, Canadian National, Rosebud, Alta.

Portable snow fences should be so designed and erected as to permit speedy dismantling and removal, even under adverse conditions. For this reason, it is not good practice to anchor the panels or sections by means of heavy stakes or posts driven into the ground. When constructing either the collapsible or folding type of snow fence, the posts should be of sufficient length to provide the height of fence, when erected, that is demanded under varying conditions. If this is done the fence can be erected at such an angle as to insure complete stability during the heaviest wind storms.

In the territory in which I am located, the prevailing winds seldom vary more than 30 deg. from a direction at right angles to the track. For this reason, most of our snow fences are of the portable variety and must be placed beyond the limits of the right of way. We use two types of portable snow fence. One is of the "knock down" pattern, consisting of 8-ft. slabs nailed together in the form of an inverted V. To insure the requisite stability under strong winds, we build a continous fence and weight it down at intervals by means of boulders suspended from the apex of the fence by wires.

The other is a folding type, of more elaborate construction, since it is built on the principle of a folding clothes horse. Each panel is 14 ft. long and consists of three pairs of posts, made of 2-in. by 8-in. rough lumber, eight ft. long. These posts are placed at each end and at the middle of the panel. Each pair of posts is hinged at a point about 2 ft. from one end by means of a short bolt, so that when erected they resemble an X with the intersection near the top. The posts are faced with 1-in. by 6-in. rough boards at 8-in. intervals. In the erection, the fence is simply opened up in the same manner as a clothes horse, and set on the surface of the ground, no anchorage being required.

When drifts build up above the top of the fence, the panels are moved to the top of the drift, thus protecting the track from further accumulation of snow. To expedite the formation of drifts behind this line of fence, additional panels are placed at intervals. This type of fence is recommended because of its simplicity, its low cost, its extreme portability and the fact that it can be removed with ease while the ground is still frozen or when surrounded by deep drifts. All that is necessary to dislodge it is a light tap from a hammer.

Anchorage Should Be Effective, but Easily Broken

By ASSISTANT ENGINEER MAINTENANCE OF WAY

In discussing this subject it is assumed that the question refers particularly to the type of portable snow fence which has struts or sills on the bottom of the posts. Snow fences of this type are harder to remove because the sills increase the difficulty of getting them out of the snow.

Whenever such fences must be removed before the drifts have melted away or the frost is out of the ground, it is advisable that the sills or struts be removed before erection, and that the ends of the posts be fast-

ened to bolts or stakes driven into the ground. This fastening can be made with wire, if to bolts, or short bolts, if to stakes. In some cases it is sufficient to place the ends of the posts in holes 2 in. or 3 in. deep, filling and tamping the earth around the posts. In the spring they can be removed easily from the frozen ground by striking a light blow with a sledge.

A popular form of snow fence is made up of slats attached to wire fencing and the whole fastened to steel or wooden posts. If necessary, these posts can be anchored both longitudinally and transversely with guys attached to iron pins or wooden stakes. Such a fence can easily be removed in the manner already described.

Lighting Station Platforms

What are the relative advantages and disadvantages of floodlighting and of individual lamps for lighting station platforms?

Local Conditions Determine Suitability

By Frank R. Judd
Engineer of Buildings, Illinois Central, Chicago

As a general rule, floodlighting has definite advantages over illumination by means of individual lamps, since it provides a greater brilliancy of illumination in which there is an absence of shadows and obstructing posts. This is conducive to the safety of passengers and facilitates the speedy handling of baggage, mail, and express.

It is obvious, however, that this type of illumination is not suitable where there are shelters or canopies over the platforms, and that the expense of a floodlighting installation cannot be justified for small and unimportant stations. In short, floodlighting seems to be suitable as a means of illuminating station platforms only at large or important stations where there are no shelters or canopies.

Both Types Have Advantages

By Arthur L. Sparks
Architect, Missouri-Kansas-Texas, St. Louis, Mo.

There seems to be a growing tendency toward the use of floodlighting for railway yards and engine terminals, and such lighting is also being used to some extent for passenger station platforms. This form of illumination provides a more intensive light where feature lighting is desired. A greater range of possible lighting results can be secured with floodlighting units, for a more general illumination, even distributed, with fewer shadows can be obtained by increasing the wattage and raising the units to a greater height. With lamps of proper wattage, the illumination can be made of sufficient strength to enable one to read labels and tags at any place on the platform, while if individual lamps are used, light of sufficient strength for reading will be obtained only at points near the lamps.

Lights at a low level are sometimes confusing to incoming train crews, especially where signal lights are to be observed, whereas floodlighting units are generally set at such height as to be well above the line of the engineman's vision. Floodlights permit the removal of lamp posts from platforms. They provide for a more permanent type of fixture, generally of aluminum or other rust-resisting material, and provide for better protection of the lamp and reflector. The units are sealed tight so that the reflectors are not affected by dust, smoke and corrosion.

With individual lamps, considerable expense is often incurred because the lamps and globes are frequently broken as a result of baggage trucks striking the lamp posts. With some types there is also considerable expense for globes which are broken by loafers. Individual lighting standards and lamps are generally less expensive to install, especially if high steel towers are used for the floodlighting units.

Generally, special wiring is not required for individual lights, and the small wattage lamps required for this form of lighting can usually be found in stock, while the large lamps for floodlighting are special types which are not carried in the usual storehouse stocks.

A suitable location is not always available for floodlighting towers, poles or other settings, while smaller lamps can be supported from brackets on the walls or suspended from the cornices of buildings, as well as on posts. They generally consume less current than the high-powered floodlights. Both types have their own advantages, and there is little likelihood of either becoming obsolete.

Spacing Coach Yard Hydrants

What is the proper spacing for hydrants in coach yards and at other points where passenger cars are cleaned and watered?

Depends Largely on Local Conditions

By R. C. Bardwell
Superintendent Water Supply, Chesapeake & Ohio, Richmond, Va.

The spacing of hydrants for cleaning and watering passenger cars in coach yards and at passenger stations will be controlled by local conditions and the wishes of the mechanical department forces who handle this work. In order to expedite the work, it is usually desirable to have hydrants so located that one will be available for use on each car and thus avoid the use of long lengths of hose which should preferably be limited to 50 ft.

The recommendation of the Joint Committee on Railway Sanitation of the American Railway Association is that, "Spacing of hydrants will be governed by car length and local conditions, but in general, hydrants should not be placed farther apart than 100 ft."

Limits Vary From 75 Ft. to 150 Ft.

By C. R. Knowles
Superintendent Water Service, Illinois Central, Chicago

No set rule can be followed in spacing hydrants for cleaning and watering passenger cars, as the proper spacing will be governed by car lengths and local conditions. The principal factors in establishing the distance between hydrants are: Whether the cars are to be cleaned and watered or watered only, and the amount of time that can be devoted to the work of cleaning or watering.

Existing practice varies greatly. Modern passenger coaches will average about 75 ft. in length, and it is apparent, therefore, that the minimum distance between hydrants should be 75 ft. In some instances, however, a spacing of 250 ft. is maintained, while in the greater number of instances they are spaced 150 ft. apart.

It is desirable not to exceed a spacing of 150 ft. between hydrants, as any saving which might be accomplished through a reduced number of hydrants and greater spacing is offset by the increased cost of hose, not to mention the objection to handling hose of unwieldy length.

Where passenger coaches are watered enroute and a limited time is provided for filling the tanks, it may be

desirable to provide a hydrant for each coach, which would mean a spacing of approximately 75 ft.

The distance established by the Joint Committee on Railway Sanitation of the American Railway Association, limits the spacing of hydrants to 100 ft. and specifies that they should be located in platforms or walks, at least 7 ft. from the center of track. The distance of 7 ft. from center of track will apply to coach yards, but is not applicable to main-line tracks, as a greater distance is required for hydrants of the standpipe type; with hydrants of this type a clearance of at least 8 ft. from center of track should be provided. The location of the hydrants within a box, flush with the platform, is preferable to the post type for main-line service or where considerable switching is done.

Close Spacing Is Preferable

By R. H. GILKEY
Division Engineer, Central of Georgia, Savannah, Ga.

Hydrants in coach yards, or at any points where cars are cleaned and watered, should be so located that the least amount of hose is required and that all coaches in any one train may be watered at the same time. If the hydrants are located at equal intervals, a short hose at each hydrant will be sufficient.

A good scheme is to have water boxes flush with the platform and to have small concrete boxes with metal tops, built adjacent to the water box, in which to keep the hose. The hose may be kept fastened to the hydrant and coiled in the hose box. This will tend to prolong the life of the hose and also make it available at all times, giving quick service.

Using Claw Bars

What precautions should be observed in the use of claw bars to avoid creating hazards to track men?

Intelligent Supervision Gets Best Results

By ROADMASTER

The use of a claw bar may seem to be such a simple matter that, from a safety point of view, it does not require much attention. As a matter of fact, although they are usually of a minor character, a surprisingly large number of injuries do result from the careless use of claw bars. For this reason, every foreman should exercise constant and watchful supervision over the handling of this frequently-used tool, and supervisors should be alert to know that they do.

In the use of tools there are two axioms that should always be kept in mind: (1) A tool should never be used unless it is in a good state of repair and is not worn beyond the limit of safe operation. Foremen should know definitely that the jaws are in proper condition for pulling spikes and that the heel is not battered or splintered. The heel should be dressed up daily on a grinder, if necessary. (2) No tool should be used for any other purpose than that for which it is designed. Do not use claw bars for nipping up the rail, as a jack lever, or for spacing ties. If a tie must be bunted, use a sledge.

The foreman should demonstrate the proper use of claw bars to every inexperienced man as soon as he enters the gang. He should then watch the men who are using this tool to make certain that it is being handled in accordance with instructions. If possible to secure them, the foreman should insist on getting claw bars with a long-raked heel that will lift the spike fully two-thirds of its length before coming in contact with the opposite rail. To complete the removal of the spike, the bar should then be lifted to a nearly vertical position and jerked upward on the spike.

It is good practice to slip a washer of ⅜-in. or ½-in. material, about 1 in. deep, over the end of the bar, welding it to the shank at the point where it strikes the opposite rail when brought clear down. This acts as a stop block and also as a reminder to the operator not to place his hands where the fingers are likely to be mashed or bruised, if the spike slips suddenly.

Whenever a spike does not lift easily, the shank of a spike maul should be used as a fulcrum under the heel of the bar. The operator should be taught to stand so that the sudden lifting of a spike, as the result of a hard pull, will not overbalance him. He should also watch carefully whether others are working near him to avoid hitting them with the bar as it is brought down or lifted suddenly.

Never allow claw bars to be left between the rails or to be thrown carelessly outside the track. They should always be made to stand in a vertical position just outside the shoulder of the embankment, by planting the small ends to a sufficient depth to insure their stability.

Creates Hazard When Used Improperly

By R. H. GILKEY
Division Engineer, Central of Georgia, Savannah, Ga.

The claw bar is one of the most frequently used tools in track maintenance, and if properly handled is one of the safest. When handled improperly, however, it can create hazards to the man using it as well as to his associates.

When moving to and from the work, the foreman should observe that it is properly placed on the motor car, for if it should fall off, it is likely to derail the car or otherwise injure one or more of the occupants of the car.

When in use, the man who is handling it should be careful to observe whether any one is standing or working behind him or near enough to be hit by the end of the bar as it is being raised or lowered, or as he swings it around into position for pulling the next spike.

When pulling inside spikes, the operator should place his hands in such a position on the shank of the bar as to avoid smashing his fingers between it and the top of the opposite rail when it is pushed all the way down to fully lift the spike.

Heel and Jaws Should Be Kept in Condition

By C. F. WOMELDORF
Division Engineer, Chicago & North Western, Norfolk, Neb.

With claw bars, as with all other tools, the first requisite for safety is that they shall be kept in first class condition. A defective tool is very likely to be an unsafe tool. A claw bar should not be used, therefore, if the jaws are worn appreciably or the heel is badly battered.

A foreman should insist that, when pulling spikes, the man handling this tool should take a good grip on the shank, placing his hands so that they will not strike the opposite rail, if he is working in the center of the track. It is also important that the jaws should have a good hold on the spike before pulling is attempted, and the man using the bar should place his feet so that he will not lose his balance if the spike starts suddenly when he is exerting a strong pull. To insure a good hold, if the ties are badly rail cut, the wood should be chipped around the spike with an adze before an attempt is made to fit the claw bar under the head of the spike.

When using a claw bar on a bridge or other structure

where men are working on scaffolds or on the ground beneath the structure, they should be warned before the claw bar is put into use. Claw bars should never be left lying between the rails at any time; neither should they be used as levers in track jacks. The greatest emphasis, however, should be placed on the necessity of keeping the heel and jaws in good condition.

Heating Mixing Water

When placing concrete in the winter, what are the advantages and disadvantages of heating the mixing water? What, if any, precautions should be observed?

No Disadvantages, but Caution Should Be Observed

By Engineer of Bridges

There are no specific disadvantages in heating the mixing water when placing concrete in the winter and there are decided advantages in doing so. In fact this becomes almost a necessity, if the normal process of hardening is to take place in the deposited concrete. The hardening of concrete is a complex chemical process which results from the combination of the mixing water with the constituents of the cement. It is a well know law of chemistry that, within limits, heat accelerates chemical combination and cold retards it.

It is good practice in cold weather to heat the aggregates enough to insure that they will contain no frost. Similarly the mixing water should be heated to insure that the temperature of the resultant mix is satisfactory. The temperature of the water should never be greater than 180 deg. as it goes into the mixer, for two reasons. First, because evaporation takes place rapidly above this temperature, so that it is more difficult to control the amount of water in the mix. Second, because too much heat tends to accelerate the process of hardening so that, if the temperature is too high, the concrete may be well beyond the point of initial set before it reaches the forms. It must be borne in mind also that considerable heat is evolved during the process of chemical combination and that this is added to the heat already in the mixture with the result that the temperature is raised still further.

In cold weather, heat is lost rapidly through ordinary radiation, through evaporation and through contact with the cold metal of the mixer and concrete buggies and with the forms. The temperature of the concrete is, therefore, considerably lowered by the time it is placed, and this loss will continue after it is deposited. For this reason, it is clearly indicated that the heating of the mixing water and the aggregates, necessary as this is, is not a substitute for proper protection or insulation of the concrete after it gets into the forms.

There Are Few, If Any, Disadvantages

By A. C. Irwin
Manager Railways Bureau, Portland Cement Association, Chicago

There are few, if any, disadvantages from heating the mixing water for cold weather concreting. The advantages amount almost to necessity but there are some precautions that should be observed.

There has been considerable misunderstanding about the effect on the temperature of the fresh concrete from heating the mixing water. The specific heat of water, that is, the amount of heat necessary to raise the temperature of water one degree, is slightly more than four times the specific heat of ordinary aggregates or of cement. Thus, although the weight of water used in the mix is small as compared with the weight of the aggregates plus the cement, the large amount of heat introduced by a unit of water compensates to a large extent for the difference in quantity of water and the solid materials. As an example: Assume a 1:2:3 mix that will require about 600 lb. of aggregate, 94 lb. of cement and 50 lb. of water (six gallons). Assume that the water is introduced into the mix at a temperature of 180 deg. F. and that the temperature of the solid materials is 35 deg. F. If no heat were lost through radiation or through contact with the mixer, the resultant temperature of the entire mix would be approximately 74 deg. Heat will, of course, be lost both during mixing and placing as well as during the period prior to the application of the protection. If the heat loss is taken as 20 per cent, the temperature of the concrete would still be approximately 60 deg. F.

While the question does not refer to the effect on the temperature of the concrete resulting from the evolution of heat occasioned by the chemical action between cement and water, it is worth while to remember that once chemical action has started, relatively large quantities of heat are generated within the body of the mass. If no heat were lost and if the hardening process started with the temperature of the mass about 60 deg. F., there would be a decided rise in the temperature of the concrete so that at the end of 48 hours a temperature of approximately 100 deg. would be attained. This suggests the importance of proper protection, that is, protection that provides insulation, particularly of small sections that are exposed on all sides.

Water should preferably be heated to approximately 180 deg. F., in order to provide sufficient heat to warm up the entire mass. At higher temperatures the water evaporates rapidly.

Aggregates should not contain appreciable amounts of frost or lumps of frozen aggregate. Such lumps thaw out slowly and require an undue proportion of the heat introduced by the water for the mere purpose of thawing the aggregate before the heat can be applied to raising the temperature. In other words, frozen lumps of aggregate should be thawed out before the aggregate is put into the mixer.

Headwalls on Pipe Culverts

What are the advantages and disadvantages of permanent headwalls for pipe culverts?

Their Use Depends on Local Conditions

By John L. Vogel
Bridge Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

In general, there is a distinct advantage in the use of permanent headwalls for pipe culverts, particularly on the upstream end of the culvert. Headwalls tend to preserve the section of the embankment, prevent the fill from encroaching on the waterway and, if near the right-of-way line, prevent the embankment from encroaching on adjacent property. If properly constructed they also prevent erosion of the embankment on either side of the mouth of the culvert, particularly at the upstream end.

If the culvert is small and is installed more for drainage than as a waterway to accommodate the flow of a stream, we usually find it unnecessary to provide headwalls, as there is seldom sufficient current to cause erosion. In my opinion the use of headwalls depends upon the conditions encountered, and the decision for or against their use at any location should be based on

the amount of drainage to be handled, the probable rate of flow, the direction of approach, the height of the embankment and the distance from the mouth of the culvert to the right-of-way line.

If the culvert is of sufficient importance to make the use of headwalls desirable, the foundation should be carried well below the bottom of the pipe and the foundation and superstructure should extend far enough to each side to insure that erosion of the embankment or of the headwall itself will be avoided.

Size of Culvert and Cost Deciding Factors

By R. H. Gilkey
Division Engineer, Central of Georgia, Savannah, Ga.

The principal disadvantage, if it may be so termed, of permanent headwalls on pipe culverts is their cost. The relative cost of headwalls as compared to the cost of the pipe is greatest for small diameter pipes, or culverts under shallow fills. Not infrequently, under such conditions, headwalls cost more than the culvert itself.

If a large diameter pipe is used under a high embankment, there is a distinct advantage in the use of permanent headwalls. A properly constructed headwall on the intake end of such a culvert tends to prevent undermining of the pipe and erosion of the embankment. At the same time it also prevents dirt and trash from the fill from running over the end of the pipe and clogging the entrance. At the outlet end, the headwall, in addition to holding the pipe together at the joints, prevents scour and undermining. Underscour frequently causes the lower section of the pipe to drop down, opening the joint between this section and the one next adjacent, frequently to the serious detriment of the embankment. Good headwalls with proper foundations will prevent scour and erosion at the ends of the pipe.

Renewing Turnouts

How many men are required in renewing a turnout? How should they be organized? What sequence should be followed in removing and placing the various parts?

A Foreman and 24 Men Are Required

By J. J. Desmond
Division Engineer, Illinois Central, Chicago

It is assumed that the switch in question is in a main line of reasonably heavy traffic which includes high-speed passenger trains, and that the entire turnout, including switch ties, is to be renewed. Before the actual work of renewal is started all of the material that is to be used should be unloaded and placed as conveniently to its point of use as conditions will permit. Every item should be checked carefully to insure that there is nothing missing.

For operating reasons, and with safety always in mind, it is advisable that the renewal be made in a single working day. The most efficient organization for this purpose consists of a foreman, an assistant foreman, and 24 experienced laborers. The foreman should plan the general procedure and look after the work in detail. He should leave it to the assistant foreman to see that the gang is properly organized to avoid lost motion and that every man is kept busy.

The general procedure and the sequence which should be followed in removing and placing the various parts are:

1. The foreman should exercise particular care to insure that the location of the frog, the switch points and the switch ties conforms to the standard plan for that number of turnout.

2. Remove the ballast to facilitate the removal of the old switch ties and the insertion of the new ones. The removal of the ballast and ties can be speeded up materially if the track is jacked up slightly, especially if the switch is in a cut or clearances are otherwise restricted. Local conditions may require, however, that the track remain undisturbed on its original bed. Again the use of jacks in this manner is bad practice, if the interval between trains is short.

3. As soon as the new ties are in place, the slide plates on the line side and the guard rail in the main track should be placed.

4. The frog and stock rail are next in order. The stock rail should be bent to the proper angle before the installation is begun. The lead rail and the slide plates on this side should then be installed.

5. The turnout rails, the switch stand and the guard rail on the turnout side are placed.

6. In order to avoid duplication of work and damage to switch ties, unnecessary spiking should be avoided during the installation. For this reason, insulated joints, fillers, etc., should be put in place and holes drilled at the time other materials are installed.

7. The track should be surfaced and lined, the ballast dressed and all old and excess materials removed, leaving the site in a clean and presentable condition.

If this method is carried out with strict adherence to standard plans it results in an efficient and economical handling of the work.

Organization More Important Than Size of Gang

By Supervisor of Track

In renewing a turnout, as in other items of maintenance, organization of the gang is of the utmost importance. A small gang, well organized, will do the work quicker and better than a larger gang that is not so well organized. A section gang of 10 men in charge of an experienced foreman will work more efficiently than a gang of 30 to 35 men under a foreman who is inexperienced in the class of work and who, therefore, does not properly organize for it.

Preparation for the task of renewal is of equal importance, particularly if the turnout is in a busy main-line track. If the preparatory work is handled properly and the gang is well organized, a gang of 20 laborers and one or two flagmen, in charge of a foreman and an assistant foreman, or experienced straw boss, is sufficient. The preparatory work includes the assembly of the new material, including the switch ties, if they need renewal, and a definite check to know that everything that is required is on hand. Every item of material should be laid out in the order in which it will be needed and at the most convenient point for moving it into the track.

The position of the ties should be marked on the rail, to avoid the necessity of spacing them after installation, and every tie should be placed opposite the point where it is to go. All rails that are to be less than full length should be cut and the bolt holes drilled. The guard rails and switch points should be permanently fastened in position on the proper rails. Arrangements should be made for a slow order during the progress of the work in order to insure safety to trains and to the men engaged in the work.

These preparations having been completed, the actual installation can be started. The flagman or flagmen should be sent out and the work carried out in the following sequence:

1. The ballast should be dug out to the bottom of the ties and the ties inserted, care being taken to space them

properly as they are placed. If practicable, the turnout rails should be removed in order to facilitate this part of the work. Only sufficient spiking to insure the safe passage of trains should be allowed, in order to reduce spike damage to the ties.

2. The rail on the line side should be removed and replaced with the new rail, the tie plates and slide plates being inserted during this operation. This includes the switch point and guard rail for this side.

3. The rail and frog on the turnout side should then be placed, including tie plates, slide plates, and stock rail. The stock rail should have been properly bent as part of the preparatory work and should have the switch point applied. The track should be very carefully gaged and lined at this stage.

4. The turnout rails, including the rail with the turnout guard rail, and the insulated joints come next.

5. While the turnout rails are being placed, the bridle rods, connecting rod and switch stand can be installed and the switch points adjusted.

6. The final operation consists of surfacing, the final lining of the turnout, restoring and dressing the ballast, loading the old and surplus material and disposing of all debris.

Depends on Equipment and Local Conditions

By N. F. Alberts
General Foreman, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.

On the road upon which I am employed, most of the work of renewing turnouts is done by specially organized rail gangs which are moved from division to division and do this work in connection with their relaying of rail. These gangs are fully equipped with power machines to perform their various operations, so that the problem of renewing switches is a simple one with them. Their work is still further simplified by the fact that it is standard practice to provide rails of the proper length for all parts of the turnout, and these are shipped as part of the necessary material for all switches.

In performing this work it is of little consequence which side is renewed first. In laying the opposite side the same procedure is followed. The old rail is thrown out; the frog, the switch and its connections and the old plates are removed; tie plugs are driven, the ties are adzed, and the plates laid; the stock rail is placed in position, the switch points, main track rails and turnout rails are laid and, if necessary, cuts are made ahead of the switch and back of the frog for closure.

If the work is to be done entirely by hand, assuming that 100-lb. rail is used in the renewal, 20 men should be able to renew a turnout, with normal intervals between trains, causing no interference with traffic beyond a reasonable slowing up of speed over the turnout. To do this, however, a well defined program is essential. The first step is to know that every item of material is on hand. A reliable tape is helpful in getting exact measurements. All switch and turnout plates, guard rail plates and other plates, all braces and other items of material, including rails, frogs, switches, switch stand and connections, compromise joints and all fittings, should be laid out where they will be most convenient to get hold of when needed.

These preparations having been made, the switch should be lined for the main track and the switch point spiked. As many bolts and spikes may be removed as is safe for the speed that is to be maintained. Remove anti-creepers, disconnect switch points and remove turnout rails. Then send out the necessary flagmen.

Remove the rail on the line side, plug spike holes and adze the ties. Lay the rail on this side, including the switch point, tie plates, guard rail and compromise joints, gaging from the old rail on the opposite side. Spike every third or fourth tie. Remove the rail on the opposite side, including the frog and switch point, and replace with new material, closing the track on both the main line and turnout tracks, following the procedure already described. Gage from the new rail on the opposite side. Connect the points and switch stand and make necessary adjustments. At the same time, replace turnout rails. As soon as the switch adjustments and main-line spiking are completed, the flagmen may be called in. The spike lining and spiking of the turnout leads can be completed after the speed restriction is removed. The next in sequence is the surfacing and lining of the switch, the dressing of the ballast and the assembly of the released material for loading.

In renewing a single turnout it is much more difficult to organize a gang properly than where the work includes turnouts to be renewed out of face. Because of the necessity of shifting men from one task to another, particularly if the work is done under traffic, it is not easy to avoid lost motion. Where several turnouts are involved, however, the same men can be used in the same operation at each turnout, and the work carried on progressively without this lost motion.

A typical sequence of these operations and the organization are as follows:

Assembling Material

No. Men	
1	Assisting foreman to make measurements.
12	With rail tongs, setting up rails, frog, switch points, etc.
1	Cleaning ballast from rail, guard rail and switch, and applying lubrication to rail ends.
3	Bending stock rail.
2	Drilling rails.
1	Setting up switch and turnout plates, other plates and braces.
20	

Preparing Track

4	Removing all bolts from turnout rails and two or four bolts from main line joints.
6	Claw-bar men pulling all spikes in turnout rails and main line rails, leaving every fourth spike in the latter.
1	With spike maul assisting claw-bar men.
1	Applying angle bars, with one bolt, to rail ends.
1	Setting up tie plates.
1	With monkey wrench, uncoupling switch connections and preparing new connections.
2	Preliminary adzing of ties.
1	Removing anti-creepers.
2	Drilling rails
1	Carrying water.
20	

Opening Track

2	Flagging.
12	Removing old rail, frog, etc., and fittings; plugging holes and final adzing of ties. Laying plates and installing new rail, guard rail, frog, points, etc.
2	Bolting new rails and uncoupling old rails.
4	Pulling remaining spikes, gaging and spiking every fourth tie.
20	

Completing Installation

2	Drilling.
2	Applying and adjusting switch connections and applying foot guards.
2	Full bolting.
8	Full spiking.
2	Nipping.
1	Distributing spikes.
1	Applying anti-creepers.
1	Picking up small material, spikes, bolts, etc.
1	Carrying water.
20	

Final Work

1 Full bolting.
2 Spacing ties.
2 Tamping loose ties.
1 Driving down loose spikes.
12 Collecting old material and surplus new material.
1 Collecting small material.
1 Gathering tools.

20

Relaying Rail

Should relayer rail from tangent track be laid with the original gage side in or out? Why?

It Is More Satisfactory to Turn the Rail

By Graham L. Smith
Engineer of Track, Northern Pacific, St. Paul, Minn.

The practice on the Northern Pacific is to lay relayer rail from tangent track with the original gage side out. By so doing, a more uniform gage is obtained and a smooth even-running surface is afforded for the passage of the wheels. Owing to wear and batter which the rail has suffered during its original service, adjacent rails will vary slightly in height on the gage side. By turning the rail and laying a new gage side, these irregularities are reduced to a minimum.

Should Be Laid With Original Gage Side In

By Engineer Maintenance of Way

Formerly relayer rail from tangent track was invariably turned to bring the original gage side out, but since the tapered wheel was adopted as a standard, this practice has been practically discontinued. As a result of the taper of the wheels, rail that is laid vertically wears more rapidly on the gage side of the running surface than on the outside, so that this surface is not horizontal in service-worn rail, but is at approximately the same angle with the vertical axis of the rail as that of the wheel tread.

When such rail is turned to bring the original gage side out, the contact between the running surface of the head and the tread of the wheels is very narrow, and shows on the head of the rail as a narrow ribbon of bright metal, sometimes scarcely wider than a line. Where canted tie plates are used this condition is overcome to some extent, but not entirely, and, in my opinion, a better job is obtained if the rail is relaid with the original gage side in.

Favors Laying Original Gage Side In

By E. L. Banion
Roadmaster, Atchison, Topeka & Santa Fe, Independence, Kan.

Relayer rail from tangent track should always be laid with the original gage side in, because this is the only way in which a full bearing can be obtained for the treads of the wheels. If the rail is turned so that the original gage side is out, the bearing surface will have a width of only ½ in. or less on rail that has been in service a sufficient time to warrant its removal from main-line tracks. The width of this bearing will necessarily depend on the amount of wear that had occured at the time of its removal.

The narrow contact surface which results from turning the original gage side out has a tendency to cause engine drivers to slip when starting trains or hauling them up steep grades. It also has a detrimental effect upon the bearing of the rail on ties or tie plates. Relayer rail should never be laid promiscuously, so that some rails have the original gage side out and the others have it in. Such a condition results in poor track.

Team Work That Counts*

By James Sweeney
Supervisor of Track, Chicago & Eastern Illinois, Danville, Ill.

THE MONTH of November with its Thanksgiving day, is generally associated with the harvest of the orchard and the field. This is the time when the farmer takes stock of the fruits of his labor and of his preparation for winter. In the maintenance of way department of our railroads we look upon this month in very much the same way. If we have been fortunate in our allotments of labor and materials the tracks are in good shape, the bridges and buildings repaired, ditches are open and banks protected. Like the farmer we are ready to meet the winter storms and look forward to some leisure to plan the work of the coming year.

Periodically, there are not enough labor and material for making these preparations for few of our railroads can afford to spend except as they earn. This year has been one when money was tight. From figures published in the *Railway Age* I find that the 22 railroads entering Chicago earned 14 per cent less in the first eight months of 1930 than in the same period in 1929. During the same period these railroads spent 12 per cent less for maintenance of way.

In the face of such a reduction in revenues, in any period of depression in the past, drastic reductions in maintenance would have followed, but in this instance the railroads have set a fine example to other industries by continuing their maintenance programs in-so-far as their ability to pay permitted and with no reduction in rates of pay.

Decreased business, to be sure, lessens the burden of maintenance work to a considerable degree. Further, the 12 per cent reduction in expenditures is not a true reflection of the reduction in work accomplished for prices of materials have been somewhat less and maintenance work has been carried on with greater efficiency by reason of less interruption by trains.

During the last few years we have heard considerable regarding a new spirit in economic affairs, and to my mind, the experience of the maintenance forces bears out all that has been said on this subject. There has been no attempt by the railroads to beat down wages or increase hours, and the maintenance forces, on their part, have shown a willingness to produce more work because they knew that payrolls were hard to meet. As a result, our tracks are going into the winter with far less than a 12 per cent reduction in condition.

Railroads as an industry have suffered more than their share during the present depression. They are facing very definite competition in the private automobile, which will either result in the abandonment of passenger service or a drastic change in that service. In freight service they have a real competitor in truck lines and a growing competitor in water transportation.

So far the railroads have produced no Moses to lead them out of the wilderness. Yet there is no indication that they are preparing to abandon their enterprise, since there is never a month that fails to show some improvement in railroad equipment or facilities. Personally, I have faith in the ability of the railroads to make the necessary changes in methods of transportation. Our problem is to keep step with the physical changes made in the properties, and so improve our methods of doing our work that these changes will be both successful and profitable.

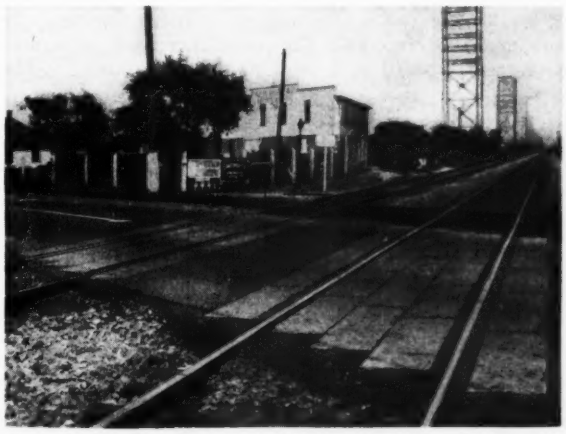
*Mr. Sweeney read this paper on the occasion of his installation as president of the Maintenance of Way Club of Chicago on November 18.

New And Improved Devices

Toledo Terminal Installs Concrete Crossings Slabs

GOOD PRACTICE in the installing of precast concrete crossing slabs in heavy-traffic highway crossings of railway tracks, is illustrated in the construction of several crossings of the Toledo Terminal Railroad at Toledo, Ohio. When installing these crossings, the space between the end of the pavement and the edge of the outside crossing slab was filled with a bituminous filler, and care was taken to provide adequate subdrainage by specifying not less than 10 in. of clean stone ballast extending to within two inches of the top of the tie. Where joints in the crossing could not be eliminated, the rails were welded together and joint bars applied. Creosoted sawed 7-in. by 9-in. by 8½-ft. ties were used and the tie plates were double-spiked on the outside of the rail.

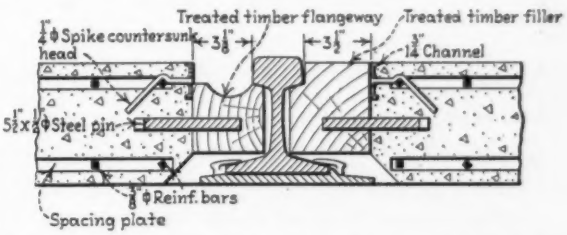
The slabs, which are known as Armored concrete crossing slabs, were furnished by the Prendergast



A View of the Installation of Concrete Crossing Slabs at Woodville Road in Toledo

Company, Marion, Ohio. They are 6 ft. long and 16¾ in. wide and are furnished in thicknesses of 5 in., 6 in., 6½ in., or 7 in., depending on the section of the rail in use at the crossing. The slabs are armored at the top edges of all sides by a 1¾-in. channel that is embedded in the concrete and fastened to it by means of ¼-in. square spikes with countersunk heads. The concrete from which the slabs are made is designed for a strength of 4,000 lb. per sq. in.

Treated oak flangeways and fillers are provided for the spaces between the rails and the slabs. Each slab contains three holes in one side to accommodate the 5-in. by ½-in. round steel dowel pins which fasten the filler timbers and flangeways to the slab. The bottom edge of that side of the slab on which the holes are located is given a 1½-in. by 1½-in. bevel in order to provide sufficient clearance for long tie plates. Those slabs which are located at the ends of the crossing have a 5-in. bevel at one end, and in these



A Sketch Showing Part of a Cross Section of an Installation of Armored Concrete Crossing Slabs

slabs the bottom edge of each side is beveled and dowel pin holes are provided on both sides to eliminate the necessity for right-hand and left-hand slabs.

These crossings were installed under the direct supervision of Ray Stephens, engineer maintenance of way of the Toledo Terminal Railroad.

New Blowpipe Accessories Now Offered by Oxweld

THE Oxweld Acetylene Company, New York, has recently introduced two new accessories for its Type W-17 welding blowpipe which are said to make this blowpipe capable of doing almost any type of work which may be required of an oxy-acetylene blowpipe.

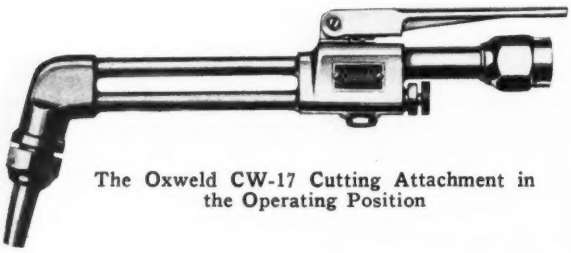
One of these attachments is known as the Type CW-17 cutting attachment and is designed to enable the blowpipe to do a reasonably wide range of cutting work.

The Oxweld W-17 Blowpipe Handle with Adaptor and W-15 Welding Head

When the long handle, which is used for operating the cutting oxygen valve, is not in use, it can be pulled forward parallel to the tubes so that the whole attachment may be carried in the operator's pocket. The attachment has the same style stem lock nut as the welding head for the Type W-17 blowpipe. The injector for the heating flames is contained in the attachment, the same as the injectors are contained in the welding heads. At the rear of the attachment near the bottom is an adjusting screw, by means of which the oxygen for the

heating flames may be regulated by the operator's thumb and forefinger while the blowpipe is in operation. The attachment is joined to the blowpipe handle in the same manner as a welding head, and the lock nut can be tightened by hand, no wrench being necessary to join the attachment to the handle. This attachment is supplied with two cutting nozzles.

The other accessory is the W-17 to W-15 adaptor which makes it possible to use any of the welding heads available for the Oxweld W-15 sheet-metal welding blowpipe with the Type W-17 welding blowpipe handle. This means that the W-17 welding blowpipe may be



The Oxweld CW-17 Cutting Attachment in the Operating Position

used on work ranging from the lightest type of welding to the heavy general welding work required of such equipment. The end of the adaptor which fits onto the W-17 blowpipe handle is similar to the rear end of a W-17 welding head. The adaptor contains passages for the oxygen and acetylene, which fit tightly against the passages in the blowpipe handle. The other end of the adaptor is exactly the same as the end of a W-15 sheet metal blowpipe handle, so that no more adjustment is required in attaching the W-15 welding head to the adaptor than to a W-15 handle.

New Tie Plate Assembly With Special Features

THE Q & C Co., New York, is now marketing a new tie plate with special rail fastenings, which has been in process of development on the Delaware & Hudson for a period of about four years in an effort to produce a stronger, safer and more economically-maintained track structure. At the present time, the D. & H. has seven miles of this new construction in service in two test installations in main-line track and has on order material for 65 track miles for installation in 1931.

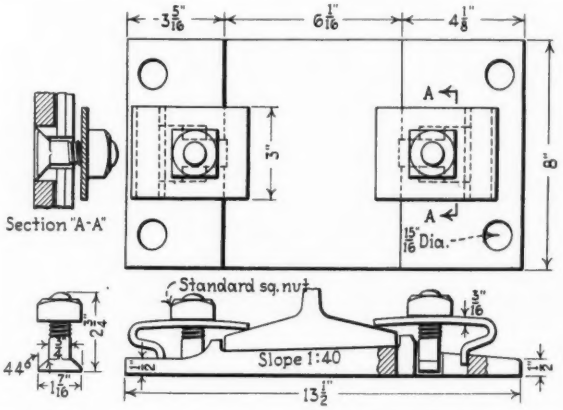
The new construction, which is known as the M. & L. tie plate assembly, consists of a double-shouldered tie plate with four round holes for lagging it to the tie, and two special spring rail clamps, or fasteners as they are called, which hold the rail to the tie plate by a bolt and nut assembly. While the tie plate has several special features, it does not in general differ widely in design from standard tie plates in use on a number of roads. The main features of the plate are that it has two rail shoulders, four round lag screw holes, 1/16-in. of camber in the rail seat in line with the rail, and a specially punched T-shape slot through the shoulders in each end of the plate, to receive the rail fasteners and their holding bolts. Within certain limits, the plate can be furnished in any size and with or without a canted seat.

The principal special feature in the plate itself is the T-shape slots for holding the rail fasteners. These slots, in which the cross-bar of the slot is 1¾ in. by ⅞ in., and the stem 1 7/16 in. by ⅞ in., are located on the longitudinal center line of the plate, with the stems of the slots projecting toward the center of the plate, in each case to a point 3/32 in. inside the vertical face of the rail shoulder. So designed, the slots receive the special rail fasteners and bolt assemblies and have the additional feature that they can be used as cut spike holes in emergency.

The spring lever rail fasteners used with the plate, which are the fundamental feature of the new construction, were designed with two main thoughts in mind; to hold the rail firmly in place and, at the same time, to permit flexibility in the track. In each case the fasteners consist of a section of 3/16-in. spring steel, three inches wide, bent into a shape resembling in section a flattened hook with an unusually long tongue and a relatively short shank. Specifically, the overall depth of the fastener is 1 11/16 in., while its broad curved top is 4½ in. long. A lip at the base of the fastener, 1⅝ in. wide and 5/16 in. long, fits into the cross-bar of the T-shape slot in the plate, while the broad top of the fastener extends over the rail shoulder of the plate to a bearing on the base flange of the rail. The fastener is held in place by means of a ¾-in. bolt having a U. S. standard thread and a flat-sided, bevel-bottomed head. The special head on the bolt is provided as a counterpart to a special recess in the bottom of the plate, designed to keep the bolt from turning after it is set in place. The bolt is slipped into the stem portion of the slot in the plate with the head downward so that the threaded shank projects up through the slot and through a hole punched centrally in the top face of the spring fastener.

A square nut is used on the bolt, without any form of washer, and is turned down on the top face of the spring fastener sufficiently to put the proper holding force on the rail base. Only about two turns of the nut are necessary after it comes in contact with the fastener to put a gripping force of about 4,000 lb. on the rail.

Joint plates with this type of construction may be similar to intermediate plates, or increased in size to meet any type of rail joint arrangement used. The



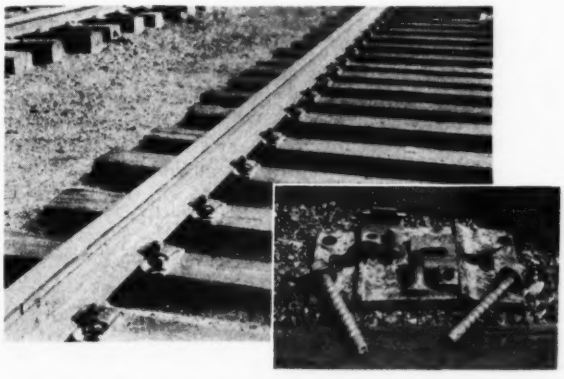
Plan and Section of the M. & L. Tie Plate for Intermediate Ties, as Used on the Delaware & Hudson

only fundamental requirement is that suitable space be available for punching the rail fastener slots.

The broad claim made for the new type of plate construction is that it produces a stronger, safer and more easily and economically-maintained track structure. The features pointed out as giving strength and safety to the track are, primarily, the use of two rail shoulders, lagging the plates to the ties, and the use of the spring fasteners with holding power in excess of that obtained in the usual type of cut-spike construc-

tion. The claim of economy in maintenance is based upon a number of features, including lagging of the plates securely to the ties; the provision of a rail fastener which precludes the necessity for spiking and respiking, with its resulting destruction of the ties; and the provision of camber in the rail seat, in combination with the spring steel rail fasteners, which is intended to permit unrestrained wave motion in the rail without transmitting this motion to the ties. It is also claimed that the fasteners will prevent rail from creeping and that they will permit rail renewal as fast or faster than where cut-spike construction is used.

During the four years that the new tie plate construction has been undergoing experiment on the D. & H., three other combination tie plate and rail fastenings were developed and in each case about 2,000 plates were installed in main-line track. Study of these plates, all



M. & L. Tie Plate Construction on the Delaware & Hudson

of which are still in service and said to be performing effectively, led to the development of the M. &. L. tie plate, and, more particularly, the type of fastening used with this plate. The D. & H. now has in service two test installations of the M. & L. plates; one about six miles in length between Delanson and Kelleys, N. Y., on the heavy freight line between Delanson and a connection with the Boston & Maine at Mechanicsville, N. Y., and the other, about one mile long, near Smiths Basin, on the main line between Albany, N. Y., and Montreal, Que.

These installations differ only in the manner in which they were put in, the one between Delanson and Kelleys being installed in connection with the construction of a new section of track, while the one near Smiths Basin was installed under traffic in well-seasoned track. In both installations the M. & L. plates are used with 130-lb. R. E. rail, which is standard on the road.

In accordance with specifications of the D. & H., the plates are 13½ in. long by 8 in. wide, with flat bottoms, 1 in 40 canted rail seats and a maximum thickness of 29/32 in. under the seat. In common with the special features of the M. & L. plate design, the plates are double-shouldered, have 1/16 in. camber in the rail seats, and have four lag screw holes and two T-shape slots for the application of the spring rail fasteners.

Joint construction in the test sections is of the two-tie suspended type and consists of four-hole Neafie joint bars, 18 in. long, and a 24-in. joint base plate, similar in section to the intermediate plates. The joint plates are punched with four rail-fastener slots, two on each side, 16½ in. center to center, and four holes for lag screws, likewise two on each side. Neither of the two installations has been in service more than eight months but it is said that within this period they have stood up very satisfactorily.

The tests on the D. & H. were planned and are being carried out under the direction of H. S. Clarke, engineer maitnenance of way.

Rust-oy—A New Rust Inhibitor

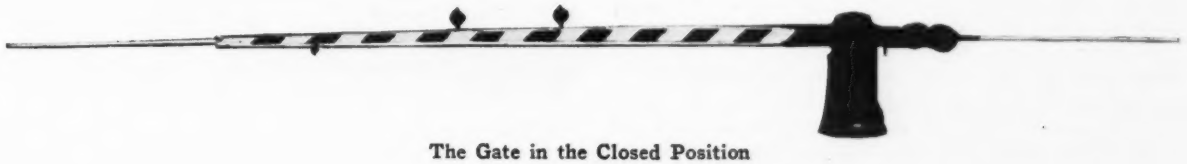
A PRODUCT known as Rust-oy is now being introduced by Utilities Accessories, Inc., New York, for use as a surface coating to prevent rusting or corrosion of new or clean steel and to stop rust or corrosive action on steel which has already been attacked. While a liquid and applied as a paint, Rust-oy is not a paint and contains no pigments or solids. It is manufactured from neutralized oils free from acids, treated with chemicals that are of themselves counter-corrosive, into which non-ferrous metals have been incorporated. The metal content in Rust-oy is in solution and does not settle out.

Rust-oy is designed as a priming coat or for spot work rather than for use as a finishing coat. The outstanding quality claimed for this product is its ability to penetrate rust to the unoxidized surface of the metal beneath and to check further rust action. The product is said to provide a durable waterproof coating with a good "tooth" for a finishing coat of lead paint or other surface coatings. It is also said that Rust-oy can be applied over a moist surface and that, in addition to its effectiveness on steel, it is equally effective for waterproofing brickwork, wood, composition board, canvas and other materials.

Automatic Electric Crossing Gate

THE BUDA Company, long a manufacturer of manually-operated crossing gates, has recently developed an electric crossing gate for automatic operation, controlled by means of track circuits upon the approach of a train. This gate is a refinement of the Buda electric gate for manual control, with added features to reduce the power requirements and minimize the necessity for the replacement of broken arms.

The change in the design of the arms permits them to be lowered gently, and the construction is such that, if the arm is lowered on a vehicle, the power applied to that arm is alternately reversed and applied so that no harmful pressure is exerted on the vehicle. Upon the removal of the obstruction, the power is applied automatically to complete the lowering of the



The Gate in the Closed Position

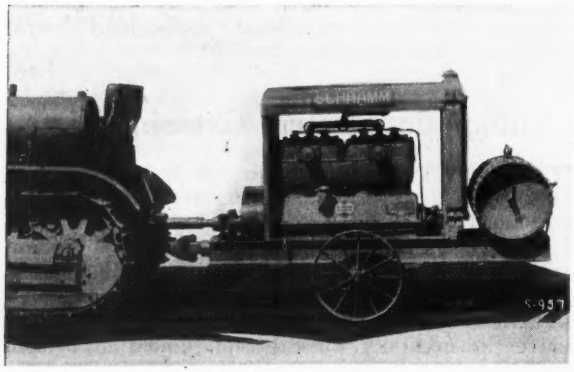
arm. If, for any cause, the arm is held down, the power is shut off until it is released.

To avoid breakage by trapped vehicles, impact cables are provided paralled to the arms, which absorb the starting impact, while, if struck, the arm will rotate horizontally through an angle of 90 deg., returning to normal position when released. The arms are held rigidly against wind pressure, since a definite impact is required to start the rotating movement when in the barrier position. Similarly the arms are not affected by wind pressure when in the open position. The manufacturer states that the operating mechanism has been designed to function under the most adverse conditions of high wind and ice load.

The arms are furnished in various lengths to meet local conditions. Auxiliary sidewalk arms can be applied without change in the operating mechanism. The arms are equipped with two red alternately flashing lights of the full-reflection type, in addition to which a 25,000-candle power beam is directed along the face of the arm when in the barrier position to make it visible to drivers of vehicles.

This Compressor Has a Caterpillar Hook-Up

SCHRAMM, INC., manufacturer of air compressors, West Chester, Pa., has developed two sizes of compressors with attachments for operation from the power take-offs of caterpillar tractors of the Caterpillar Tractor Company, Peoria, Ill. The two compressor units, which are mounted on steel carriages and suitably housed for protection from the weather, are independent units without auxiliary drive units for self-operation. One of these compressors has a displacement of 120 cu. ft. of free air per minute and the other 240 cu. ft. These compressors



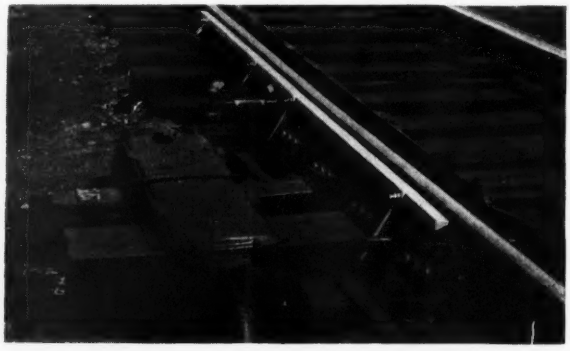
The Schramm 240-cu. ft. Compressor Hook-up with a Caterpillar 30

are equipped with a special drawbar and drive shaft so that they can be hauled and operated over any character of ground by the caterpillar tractors. The smaller compressor is designed for use with the Model 15 tractor, and the larger one with the Model 30 tractor.

The Schramm compressor attachments are simple and yet of sturdy construction. To haul the compressor, the tractor is attached by means of a universal drawbar coupling, while the compressor drive is accomplished by a power take-off shaft from the tractor, which is fitted with a double universal joint and long spline shaft coupling. These attachments provide a flexible hook-up which permits operation of the compressor over rough roads and such conditions as might be encountered on railroad right-of-way. The compressor units can be coupled to the tractor or uncoupled easily, and the tractor can therefore, be made free readily for the many other purposes for which it is suited, without being encumbered by the compressor unit. At the same time, the compressor attachment to the power take-off of the tractor does not interfere with the availability of the take-off for operating other power units when it is not operating the compressor. By means of a throw-out clutch on the power take-off, the tractor can be started and operated separately from the compressor, which facilitates the starting of the tractor and keeps the compressor idle when not in use and being drawn from one point to another.

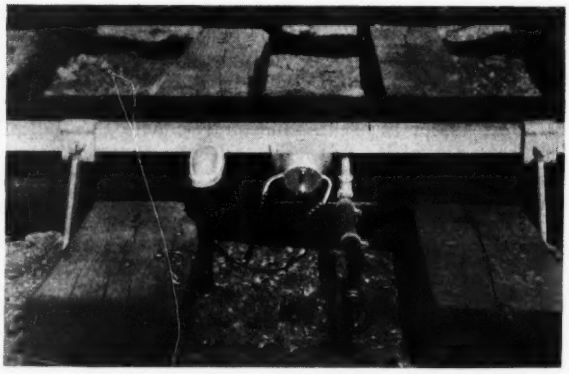
A New Gas-Burning Switch Heater

THE Chausse Oil Burner Company, Elkhart, Ind., has recently placed on the market a gas-burning switch heater which, while essentially similar in design and construction to this company's oil-burning switch heater, now includes a centrally-controlled ignition system, consisting of a nichrome wire electrical ignition coil mounted on lava insulators. Briefly, this switch



An Installation of the New Switch Heater

heater, which utilizes either artificial or natural domestic gas as fuel, consists of a steel heat distributor 14 ft. long which is fastened to the ball of the rail by adjustable malleable iron clamps that are attached to the ties. The gas is admitted at the center of the heater and is distributed along the rail through the combustion chamber. The nichrome ignition coil is situated at the center of the heating unit in a steel housing and is so



A Close-Up View of the Burner Showing the Gas and Ignition Connections

designed that gas may be turned into the switch heaters and ignited from a central location such as a switch tower.

These heaters are reported to consume about 75 cu. ft. of gas per hour, or 150 cu. ft. per switch. One ignitor consumes 220 watts an hour and hence 440 watts an hour are consumed for each switch. The ignitors may be left turned on constantly during severe storms, or switched on and off periodically to assure that all heaters are functioning. It is said that this heater maintains a temperature in the rail well above the melting point but not sufficiently high to affect its texture and that a one-foot strip on each side of the rail is kept free of snow. It is also reported that practically no flame is visible and that consequently there is no interference with low switch targets.

New Convertible Shovel Contains Important Features

A NEW shovel, known as the Unit 512, has been designed by the Universal Power Shovel Company, division of the Unit Corporation of America, Milwaukee, Wis., in which a number of features of construction have been incorporated that are said to render it quick, easy and economical of operation. One of these features is a one-piece gear case which encloses all of the operating mechanism so that it operates in a continuous bath of oil and is similar to the design which is found in automobiles and trucks. This construction is claimed to assure maximum wear through positive lubrication and at the same time to be advantageous to the operator in that it reduces trouble and inconvenience incident to the oiling and greasing of the shovel mechanism.

New disc clutches, which are claimed to be so constructed that each one can be adjusted at a single point without the assistance of a wrench, are another important feature of the new shovel. It is said that this feature assures use of all of the clutch surface, which results in easy adjustment and operation and longer life of the clutch material. The facing is guaranteed to last a year. The gears in the machine, which are drop-forged and double heat-treated, are mounted directly in ball bearings which are in turn mounted in the transmission case in such a way that misalinement is said to be impossible. The shafting in the gear case is splined and full floating, thus, it is said, equalizing the torque loads. Misalinement is further prevented by the mounting of the transmission case and power plant on the one-piece turntable in such a manner as to form practically an integral unit.

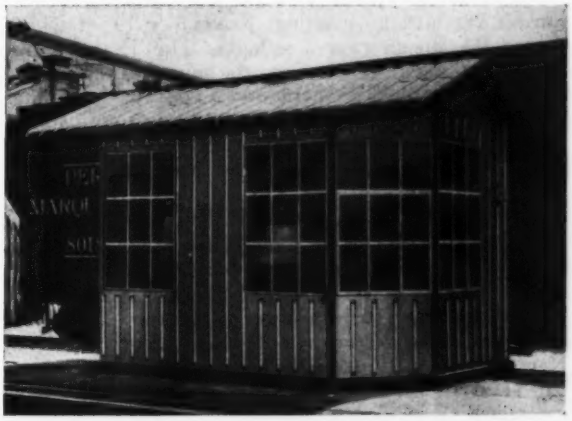
A free-working, split crowd drum, within reach of the driver's seat as are all the controls, enables the slack in the crowd lines to be taken up in a few seconds. In this operation, the operator uses only the boom hoist lever and rotates the free-working, special split crowd drum. Little muscular effort is said to be required to operate the clutches, and all of the five disc clutches are of a uniform size. The turntable is mounted on rollers which are equipped with roller bearings, resulting, it is said, in a free and easy swing requiring a minimum of power. It is claimed that the swing and hoist can be operated without sacrificing the power of the engine.

A positive independent forward and reverse crowd is said to assure complete control of the dipper stick and the most adhesive materials can be quickly shaken from the bucket. The design is intended to make the weight of the boom act as a shock absorber to relieve the gears and cable of excessive strain. The shovel is powered by a 48-hp. Waukesha VK motor with a governor and having a bore of 4¼ in., a stroke of 5 in. and a speed of 1,400 r.p.m. This power is said to be ample for extreme digging conditions and to pull the shovel through five dips a minute. It is also claimed to be able to move the turntable through six revolutions per minute. The traction speed ranges from ¾ to 1¼ miles per hour.

Equipment includes an air cleaner, American Bosch magneto and a pusher-type fan which ventilates the cab. The muffler and exhaust conduct gas high in the air and are said to increase operating comfort and to make the machine quiet in operation. The machine is said to be easily and quickly converted to either a clamshell, dragline, trenchoe, crane or backfiller, and these conversions may be made readily in the field.

Liquid Metal Protects Galvanized Surfaces

LIQUID Metal Products, Inc., Chicago, is manufacturing a metal compound in liquid form for the protection of galvanized surfaces, which is known as Stibloy. This compound is said to extend the life of galvanized surfaces by protecting them from the effects of atmospheric conditions, gases, acid fumes, smoke and brine. It is not a paint but acts as a base on galvanized surfaces for paint, enamel and lacquer.



The Exterior of This Scale House on the Atchison, Topeka & Santa Fe Is Covered with a Coat of Stibloy

Stibloy is said to protect and preserve galvanized roofing, siding, sheeting, guttering, downspouts, wire fencing, air ducts, car roofing and all other galvanized products.

The compound is applied with a brush or by dipping the surface to be protected into the liquid, one coat of which is said to be sufficient. The treated surface is allowed to dry completely, which takes from three to five hours, and water is then applied to the entire surface to complete the treatment. When applied with a brush, it is said that a gallon of Stibloy will cover approximately 1,000 sq. ft. of surface, while when the dipping process is used, an average of 1,500 sq. ft. can be covered.

THE LONGEST TANGENT—The Trans-Australian Railway runs for an even 300 miles across the sandy wastes of the Nullarbor Plain, without a curve. This is believed to be the world's longest tangent.

WITH THE ASSOCIATIONS

Tie Producers Association

The National Association of Railroad Tie Producers has selected the West Baden Springs Hotel, West Baden, Ind., as the location for the thirteenth annual convention which will be held May 5-7, 1931.

Roadmasters' Association

The members of the Executive committee will meet at the Hotel Stevens, Chicago, on December 6 to select the personnel for committees for the ensuing year. The committee appointed to consider hotel arrangements in Chicago will also present its recommendations at that meeting.

Bridge and Building Association

The members of the Executive committee will meet in Chicago on December 13 to select the personnel of committees for the ensuing year and to initiate plans for the next convention. At this meeting a report will also be received from the committee appointed to consider hotel arrangements at Toronto.

Maintenance of Way Club of Chicago

The club held its second meeting for the fall season on Wednesday evening, November 19, at which time S. D. Rosen gave a talk on "The Truth About Russia," 55 members and guests being present. The next meeting will be held on Wednesday evening, December 17, when A. F. Blaess, chief engineer of the Illinois Central, will give a talk on "The Correction of Soft Roadbeds."

American Railway Engineering Association

As the work of the committees is now drawing to a close for the year, only three committees met in November and none are scheduled to meet in December. The committees which met were: Masonry, November 6-7 at Chicago; Rivers and Harbors, November 7 at New York; and Wooden Bridges and Trestles, November 11 at Chicago. Nineteen of the committees have completed their reports and submitted them to Secretary Fritch and a number of the reports are now in the hands of the printer. The first bulletin containing these reports will go into the mails about the middle of December.

The committees on Personnel of Committees and on Subjects have completed their tentative assignments for next year and these assignments will be published during the month.

The Board of Direction met in New York on November 18.

American Wood-Preservers' Association

The members of the Executive committee met at the office of the secretary in Washington, D. C., on November 14. Reports were received from the committees on program and on arrangements for the convention which will be held in Philadelphia, Pa., on January 27-29, 1931. Extended consideration was also given to tentative reports presented by the chairmen of the committees on Processing of Wood and on Preservatives. Plans were initiated for the operation en route to the convention of special cars from Chicago, St. Louis, Louisville and Cincinnati to Pittsburgh, which cars will be assembled at this point into a special train for operation to Philadelphia, stopping en route to visit the timber-treating plant of the Baltimore & Ohio at Green Spring, W. Va.

Following the receipt of the report of the Nominating committee the Executive committee has distributed a ballot to the members on which the following are recommended for election: President, J. S. Penney, vice-president of the T. J. Moss Tie Company, St. Louis, Mo.; first vice-president, Elmer T. Howson, editor *Railway Engineering and Maintenance,* Chicago; second vice-president, R. S. Belcher, manager treating plants, Atchison, Topeka & Santa Fe System, Topeka, Kan.; secretary-treasurer, L. H. Dawson, Washington, D. C.; members of executive committee, F. C. Krell, forester, Pennsylvania System, Philadelphia, Pa., and R. S. Manley, president of the Texas Creosoting Company, Orange, Tex.

International Track Supervisors' Club

Thirty-eight members and guests were present at the meeting of the International Track Supervisors' Club held on November 20 at the Hotel General Brock, Niagara Falls, Ont., Can. P. Quinlivan, roadmaster, D. L. & W., Buffalo, N. Y., was elected president for the ensuing year; W. H. B. Bevan, assistant district engineer, Canadian National, Toronto, Ont., was elected vice-president, and F. J. Ursem, special representative, Ingersoll-Rand Company, Cleveland, Ohio, was elected secretary-treasurer.

Papers presented at the meeting included the following: "Keeping Pace with Progress," by E. J. Cullen, division engineer, Lehigh Valley, Buffalo, N. Y.; "Snow-Melting Devices," by J. B. Delitsch, assistant engineer, N. Y. C., Buffalo, N. Y.; and "Maintenance of Tie Tamping and Pneumatic Track-Laying Equipment," by F. J. Ursem, Ingersoll-Rand Company, Cleveland, Ohio.

The next meeting of the club will be held on February 20, 1931, at the Hotel Statler, Buffalo, N. Y.

New Books

New Building Estimators' Handbook, by William Arthur. 1,024 pages, illustrated, 7 in. by 4½ in. Published by Scientific Book Corporation, 15 East Twenty-sixth street, New York. Price $6.

This is the fifteenth edition of a handbook that appeared first in 1909 as a 150-page manual. According to the author, it is designed for the use of those concerned with all kinds of ordinary buildings, including dwellings, office buildings and railroad shops. It deals with the details of construction that go to make up the building rather than the building as a whole, and contains chapters on such subjects as excavation, piling, concrete, brickwork, structural steel, sash, glass, carpenter work, painting, plumbing, etc. There are also introductory chapters on measurements, quantity estimating, and speed of construction. The treatment of the chapters on various details, which is uniform throughout, embraces descriptions and instructive text matter, followed by data on the nature and cost of the materials available and on costs of applications or construction. In general, the matter appears to be thoroughly up to date, but, like subsequent editions of any old book, contains some references of an obsolete character. This comment applies particularly to the text matter and references relating to proportioning, mixing and placing of concrete.

RAILWAY NEWS BRIEFLY TOLD

The Mississippi Valley Barge Line Company, probably the first privately-owned barge line on the Mississippi and Ohio rivers, began operations on October 3 when a tow left Cincinnati, Ohio, for New Orleans, La.

Emergency reductions in rates to and from drought-stricken areas, which were placed in effect in August by the railroads as a relief measure, had by November 5 resulted in the movement of 46,375 cars of feed and livestock, according to reports compiled by the Car Service Division of the American Railway Association. These rates were made effective in those districts certified by the Department of Agriculture as affected by the drought, and involved 21 states.

In a resolution, which was adopted on October 27 at a conference of the general chairmen of the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees at St. Louis, Mo., direct action was urged to prevent serious injury of the railways by competing agencies. Determination of the true cost to the public of the highways used by motor trucks and motor coaches, regulation of motor transport services, extension of principles underlying railway labor laws to cover operators of motor vehicles, and the regulation of freight forwarding companies, are among the policies advocated.

According to a recent study, there are now 37 companies engaged in the transportation of crude oil by pipe line, which operate a total of 85,796 miles of pipe lines, representing an investment of $845,455,568. The mileage of pipe lines operated by the separate companies ranges from 32 to 13,197 miles, the investment for the former being $58,920 and for the latter, $103,595,571. The Interstate Commerce Commission reports that in 1929, the total operating revenues of pipe lines amounted to $251,410,920, which was derived from the transportation of 1,156,350,772 barrels of oil. The operating expenses amounted to $102,101,243, leaving a net income of $142,216,242.

Passenger-train schedules between Chicago and the North Pacific coast have again been reduced about three hours eastbound and one hour westbound. The speed controversy was reopened on November 9 when the Great Northern reduced the running time of its Empire Builder eastbound from 61 hr. to 58 hr. and westbound from 60¾ hr. to 59¾ hr. The Chicago, Milwaukee, St. Paul & Pacific has announced similar changes in the schedule of the Olympian and the Northern Pacific placed its North Coast Limited on a schedule of 58½ hr. eastbound and of 60¼ hr. westbound on November 16. The Chicago & North Western and the Union Pacific have met the faster schedules by reducing the running time of the Portland Rose eastbound 3¼ hr. to 57½ hr. and westbound 1¼ hr. to 59¾ hr.

The employees of at least five large railway systems are systematically contributing to the aid of former employees who have been released from service because of the business depression, by payroll deductions, cash contributions, and in several cases by the distribution of wearing apparel. These roads are the Chicago, Burlington & Quincy; the Chicago & North Western; the Chicago, Milwaukee, St. Paul & Pacific; the Chicago, Rock Island & Pacific; and the Pennsylvania. The plan of relief, which is typical on all the above-mentioned roads, contemplates that the officer or employee shall deposit his contribution with the company treasurer, the funds then being administered by an executive relief committee which is headed by the vice-president in charge of operation. Terminal and divisional committees have been formed, whose duty it is to make a survey of the needs of families and approve applications for aid.

A Program for the Railways

A program containing definite recommendations designed to place railway earnings and traffic on a more favorable basis than now existing, was adopted by the Association of Railway Executives at a meeting in New York on November 20. The program included recommendations for a respite from rate reductions by regulation bodies; a withdrawal of governmental competition through direct operation of transportation facilities, as well as indirectly through subsidies; a fairly comparable system of regulation for competing transportation service by water and on the highways; extension of jurisdiction of the regulatory authorities over commerce carried by bus and truck; adequate authority for rail carriers to operate such facilities without discrimination; and adequate provision for a license fee to be imposed on all motor vehicles using highways for hire or profit, so that they will participate properly in the construction and maintenance costs of the highways.

The Boston & Maine has developed an employment system whereby jobs for 200 additional employees are to be created without an increase in expense to the railroad. This plan, which was suggested by the Boston & Maine Mechanical Employee's Association, will eliminate seven-day jobs in the mechanical department and thus provide work for additional men on five and six-day schedules. An entirely different method has been introduced by the Chicago & North Western, which is providing employment for about 1,700 additional employees during November and December without an immediate effect on operating expenses. This is being done under an order of the Interstate Commerce Commission, whereby the North Western is enabled to make heavy repairs to cars and locomotives not now in service, at a cost of about $500,000, and to postpone the charge to operating expenses until the equipment is returned to service. The commission has also granted permission to the Missouri-Kansas-Texas to administer the same plan to the extent of $200,000 worth of repairs.

Three classes of passenger fares and accommodations between Chicago and Pacific Coast points are to be tried out by all roads operating between these points in a six-months' experiment which will commence on January 1. First, second and third-class tickets are to be sold. First-class tickets will be good in standard sleeping and parlor cars and will be sold at the present standard one-way rates, which are $79.84 to the Pacific Northwest and $77.20 to California points, exclusive of sleeping car fares. The total rate to California, including the sleeping car rate, is $103.47. Second-class tickets are to sell at $65, or $77.75 including the tourist sleeping car fare, and will be good in tourist sleepers. The third-class rate is to be $50 and purchasers of this class of ticket will be entitled to ride in coaches and chair cars only. The first announcement of the adoption of this system was made by the Atchison, Topeka & Santa Fe on November 10 and by November 15 all carriers offering service to the west coast or participating in such service had announced their decision to try the three rates.

Construction News

Projects Contemplated

Atlanta & St. Andrews Bay—Has applied to I. C. C. for authority to construct 4½-mile extension, Panama City, Fla., from Millville Jct. to Bay Harbor.

C. R. I. & P.—Has applied to I. C. C. for authority to construct 3-mile spur track, Bowen, Mo.

M. P.—St. Louis county, Mo., has requested the Mo. Pub. Serv. Com. to authorize the construction of a highway subway under this company's tracks at Big Bend road, Valley Park, Mo., $36,800. This company plans the construction of a 2,500,000-bu. grain elevator, Kansas City, Mo., $1,800,000, involving also the construction of 8 miles of yard trackage.

Wab.—St. Louis county, Mo., has asked the Mo. Pub. Serv. Com. to authorize the elimination of a grade crossing, Ferguson, Mo., by construction of underpass, $63,000.

Approved by Commissions

Algers, Winslow & Western—By I. C. C. to construct 4.2-mile extension, Pike county, Ind., to connect with the 1.5-mile line of the Enos Coal Mining Co.

B. R. & P.—Plans and estimate of $93,000 for elimination of Loveland road grade crossing on the Orchard Park-Griffin Mills county highway, Aurora, N. Y., approved by Pub. Serv. Com. of N. Y.

D. L. & W.—Ordered by Pub. Serv. Com. of N. Y. to reconstruct bridge carrying this company's tracks over the Pavilion-Greigsville county highway, York, N. Y. Detailed plans for the elimination of the Castle Creek-Whitney Point highway crossing, Barker, N. Y., approved by Pub. Serv. Com. of N. Y. Commission has also approved plans for the elimination of the Gulf Bridge county highway crossing, Chenango, N. Y.

Erie—Revised plans for elimination of King crossing on the Nunda-Portageville highway, Portage, N. Y., approved by Pub. Serv. Com. of N. Y. Pub. Ut'y Comm'rs of N. Y. have approved proposed agreement between this road and Bergen county for elimination of grade crossing at Edgewater ave., Ridgefield, N. J.

I. C.—Has been directed by the La. Pub. Serv. Com. to file detailed plans and specifications for the construction of new union station, New Orleans, La., by January 24, 1931.

L. V.—Pub. Serv. Com. of N. Y. has designated for elimination the Cayuta Creek road crossing, Barton, N. Y., by construction of overpass, $189,000.

M. P.—Authorized by Mo. Pub. Serv. Com. to construct reinforced concrete and steel highway subway at Big Bend road, Valley Park, Mo., $37,000.

M. C.—By I. C. C. to construct new line from point on Grand Rapids division westerly 2.95 miles to connection with the former Michigan railroad, an electric line, and to reconstruct that line northerly to Grand Rapids, Mich., a total distance of 10.25 miles; new line, $184,835, reconstruction of old line, $958,000.

N. Y. C.—Pub. Serv. Com. of N. Y. has designated for elimination a grade crossing at Main st., Philadelphia, N. Y., $114,500; a grade crossing on Clover st., county highway, Pittsford, N. Y., $147,000; the North Main st., crossing, Elbridge, Onondago county, N. Y.; the Brutus st. crossing, Brutus, N. Y., by construction of overpass, $189,000; and the North Main st. and Mud Mill road crossings, Newark, N. Y., by construction of overpass at North Main st. and closing of Mud Mill crossing. Ordered by B'd of Pub. Ut'y Comm'rs to eliminate grade crossing on the West Shore at Fort Lee road, Bogota, N. Y. Pub. Serv. Com. of N. Y. has approved an estimate of $61,600 for the reconstruction of the bridge carrying N. Y. C. tracks over the Trenton-Prospect-Remsen state highway, Trenton, N. Y.

N. P.—By I. C. C. to build branch line between Moclips, Wash., and point on Hoh river, near Spruce, Wash., 59.44 miles, $5,836,235, instead of via route previously authorized by I. C. C. between Aloha Wash., and point on Hoh river, 67 miles.

Pittsburgh, Shawmut & Northern—Plans and estimates of cost for reconstruction of bridge over Belvidere-Transit Bridge-Angelica county highway, Angelica, N. Y., approved by Pub. Serv. Com. of N. Y.

St. L.—S. F.—Authorized by Mo. Pub. Serv. Com. to construct reinforced concrete viaduct at Primary Road No. 66, St. Louis county, Mo., $66,000.

Term. R. R. Assn. St. Louis, Mo.—Illinois Commerce Commission has ordered this road and the St. Louis Electrical Terminal to construct a grade separation structure at intersection of their tracks and Broadway, Venice, Ill.

Projects Authorized

C. N. R.—Has prepared plans for construction of new station, St. John, N. B., as part of general program of improvement to existing facilities at that point. For purpose of relieving unemployment this road has commenced or will commence in near future work on following construction projects involving expenditure of about $4,000,000: Six-mile cut-off, Brantford, Ont., to eliminate heavy grades; new station and grade crossing elimination, Hamilton, Ont.; $90,000 stores building and several grade separation projects, Toronto, Ont.; two subways, London, Ont., and one at Oshawa, Ont.; reconstruction and extension of station, Levis, Que., $75,000; new bridge over the Becancour river, Becancour, Que.; concrete bridges at Sudbury, and Ostrom, Ont.; and grade separation structures at Trenton, Ont., Scotia Jct., and Quebec, Que.

New York City—Transit Commission of New York City has announced program for elimination of 84 grade crossings in 1931, at estimated cost of $27,100,000.

Penna.—To begin immediately the construction of new produce terminal, Baltimore, Md., to supersede present Bolton Station yard, $750,000. To have eight 2,300-ft. team tracks with a combined capacity of 325 cars, tracks to be separated by 65-ft. concrete drives. Includes construction of modern brick office and warehouse to contain display space, office and auction facilities. Construction of river-rail coal trans-shipment plant on Ohio river at Conway yard, Baden, Pa., $350,000; to have capacity of 3,200 tons of coal from barges to railroad cars each 8-hr. shift, and 1,000,000 tons annually.

Bids Received

C. P. R.—Grading for construction of nine-mile branch line around Skaha lake, B. C., to replace ferry service.

Port of New York Authority—On or about December 12 for demolition of buildings now occupying site of proposed 14-story union freight station, New York, to be used by all roads in the port district for delivery and receipt of l.c.l. freight, total cost, $16,000,000

Term. R. R. Ass'n St. Louis, Mo.—Construction of 8-story, reinforced concrete, brick and stone merchandise mart, surmounted by 20-story tower, St. Louis.

Contracts Awarded

A. T. & S. F.—Construction of branch line from Heaton, Tex., southwest 8½ miles—Sharp & Fellows, Los Angeles, Cal.

B. & O.—Construction of culverts, grading and drainage facilities for second track between Bructon, Pa., and Snowden, 2 miles—Empire Const. Co., Baltimore, Md. Construction of water-treating plant, Indianapolis, Ind.—Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

C. N. R.—Construction of superstructure between north side of St. Antoine st. and south side of Ottawa st., of main viaduct leading from Victoria bridge to new central passenger terminal, Montreal, Que.—Dominion Bridge Co., Montreal. Construction of 16 buildings including stations and other structures on the Hamlin (Sask.)-Glenbush branch—Theodore Rockstael, St. Boniface, Man. Construction of similar buildings on the Melfort (Sask.)-Aberdeen branch—William C. Wells, Wilkie, Sask.

Cin. (Ohio) Union Term.—Construction of Western Hills viaduct, Cincinnati—MacDougal Const. Co., Atlanta, Ga.

C. M. St. P. & P.—Construction of building to house waste reclamation plant, Milwaukee, Wis., for extracting oil and grease from used journal box waste—Bentley Bros., Inc., Milwaukee. Furnishing and installation of renovation equipment—Journal Box Servicing Corp., Indianapolis, Ind., $100,000.

C. C. C. & St. L.—Construction of highway grade separation structure at 41st st., Cleveland, Ohio—Industrial Const. Co., $200,000.

Kan. City Term.—Construction of superstructure of 1,200-ft. viaduct over Oak st., Kansas City, Mo.—McClintic-Marshall Co., Chicago, $95,000.

L. A. & S. L.—Construction of 7-story reinforced concrete and steel

warehouse, 100 ft. by 620 ft., Los Angeles, Cal.—The J. V. McNeil Co., Los Angeles, $3,500,000.

L. & N.—Construction of yard office, service building and signal tower, Birmingham, Ala.—Johnson Const. Co., Birmingham.

M. P.—Construction of one-story brick, tile and reinforced concrete warehouse, McAllen, Tex.—W. A. Velten Const. Co., Brownsville, Tex. Filling of three bridges, Reeds Springs, Mo., involving 500,000 cu. yd. of earth—A. Guthrie & Co., St. Paul, Minn.

N. Y. C.—Grading and track construction in connection with conversion of existing flat freight yard, Stanley Yard, Toledo, Ohio, into hump yard with car-retarder operation—Walsh Const. Co., Davenport, Iowa., total cost $1,400,000. Involves construction of northbound receiving yard of eight 110-car capacity tracks and conversion of present flat yards into hump yard by changing the grade and adding 16 tracks. Elimination of grade crossing at Midler ave., Syracuse, N. Y.—Walsh Const. Co., Syracuse, and installation of sprinkler system on Pier K. Weehawken, N. J.—Rockwood Sprinkler Co. of Mass., Worcester, Mass. Elimination of three grade crossings, Frankfort, N. Y.—Walsh Const. Co., Syracuse, N. Y., $141,799.

N. & W.—Fabrication of steel for superstructure of two bridges, Stanley, Va., 720 ft. long, and Rileyville, Va., 1,229 ft. long—Virginia Bridge & Iron Co., Roanoke, Va.

Penna.—Elimination of Castile road crossing, Genesee Falls, N. Y.—Bates & Rogers Const. Co., N. Y., $88,333. Construction of addition to existing grain elevator, Erie, Pa., to provide additional storage capacity of 1,500,000 bu.—Rust Engineering Co., Pittsburgh, Pa., $223,000; improvements to four 17-ton ore unloaders on dock No. 11, Cleveland, Ohio—Wellman Engineering Co., Cleveland, $106,000; and construction of underpass at Bloomsdale road, Bristol, Pa.—Harry F. Curtis, New York, $266,000.

Port Term. R. R. Assn.—Construction of 7.76-mile extension, Houston, Tex., to serve north side of ship channel—Lone Star Const. Co., Houston.

S. P. & S.—Track laying for 29-mile extension of Oregon Electric from Lebanon, Ore., into Calapooya valley—Hauser Const. Co., Portland, Ore., ballasting—Meyers Contr. Co.

Wabash—Construction of enginehouse, Landers yard, Chicago—H. A. Peters, Chicago, $40,000.

In answer to the invitation of the Interstate Commerce Commission to present to it comments on the application of the Inland Waterways' Corporation for permission to extend its service to the Illinois river, the southwestern railroads have filed a statement vigorously opposing the application. The statement says that the barge line has now reached "the period of its existence when experimentation must cease and the commission should no longer blindly and without justifiable facts before it further ingraft it into our transportation system."

Supply Trade News

Personal

Henry Harnischfeger, president of the Harnischfeger Corporation, Milwaukee, Wis., died on November 15.

Addison H. Beale, president of the A. M. Byers Company, Pittsburgh, Pa., died suddenly on October 28.

C. A. Irwin, vice-president of the Alpha Portland Cement Company, Chicago, died suddenly on October 29.

Henry Lang, vice-president of the Ingersoll-Rand Company, New York, died at his home in Montclair, N. J., on November 10, at the age of 66.

A. F. Gartz, who retired as treasurer of the Crane Company in 1905, died on October 29, in Altadena, Cal., following a heart attack.

Owen H. Persons, assistant manager of sales of the **American Steel & Wire Co.,** with headquarters at Philadelphia, Pa., has resigned to become general manager of sales of the **Edgecomb Steel Company,** with headquarters at Philadelphia.

Comfort A. Adams, chairman of the technical board of the **Welding Engineering & Research Corporation,** New York, has also been elected president to succeed **William T. Kyle,** resigned, and **James W. Owens,** a member of the board of directors, has been elected secretary and director of engineering. **J. H. Deppeler** has been elected vice-president of this company and **Charles A. McCune,** a member of the board of directors, has been elected treasurer and director of research.

General

The Jones & Laughlin Steel Corporation plans the construction of a one-story storage and distributing unit at Chicago to cost $100,000.

Joseph T. Ryerson & Sons, Inc., has acquired the stock and good will of the sheet metal division of the **Richards Company, Inc.,** Boston, Mass.

The Cleveland Pneumatic Tool Company, Cleveland, Ohio, has moved its Philadelphia office from the Bourse building to the Terminal Commerce building.

The Keystone Steel & Wire Company, Peoria, Ill., plans the construction of a one-story addition to its plant in that city to increase its storage and distributing facilities. The cost is estimated at $100,000.

The Fort Pitt Bridge Works, Pittsburgh, Pa., and the **Massillon Bridge and Structural Company,** Massillon, Ohio, have been consolidated under the name of the **Fort Pitt Bridge Works,** with general offices in the H. W. Oliver building, Pittsburgh.

The American Manganese Steel Company, Chicago Heights, Ill., has appointed the **Southern Tractor Supply Company,** 406 Geer building, Durham, N. C., its representative for the District of Columbia, North Carolina, South Carolina, Eastern Tennessee, Virginia and West Virginia.

The Federal Cement Tile Company, Chicago, which has purchased the **American Cement Manufacturing Company,** Pittsburgh, Pa., has merged the two companies under the name of the **Federal-American Cement Tile Company,** officers of the first-named company becoming officers of the new company.

The National Aluminate Corporation of Chicago has purchased the chemical products business of the **Paige & Jones Chemical Company,** N. Y., and will operate this company as a division of the National Aluminate Corporation under the name of the **Paige-Jones Chemical Company.** The executive offices of the latter company will be at 6216 West Sixty-Sixth place, Chicago.

The Bethlehem Steel Company, Bethlehem, Pa., has taken over the Storm King switch heater of the **Storm King Switch Heater Association,** St. Louis, Mo., and is manufacturing and selling the heater under the new name, Winter King switch heater. A detailed description of this switch heater appeared in the daily issue of *Railway Engineering and Maintenance* for March 14, 1930, page 628-D207.

Trade Publications

Zinc-Insulated Fence.—The American Steel & Wire Company, Chicago, has issued a 30-page catalogue which contains complete information in regard to its zinc-insulated U. S. fence.

Portable Electric Lighting Plants.—Bulletin No. 100-B of the Sullivan Machinery Company, Chicago, which has recently been issued, sets forth in considerable detail the various features of the Sullite portable electric plants of this company. This bulletin contains eight pages and is illustrated.

Bulldog Tie Spacers.—The Bulldog tie spacers for use on bridges and trestles to prevent the guard rails and ties from moving with respect to each other is described and illustrated in a four-page folder which has recently been issued by the American Air Filter Company, Inc., Louisville, Ky.

Locomotive Cranes. — The Industrial Brownhoist Corporation, Cleveland, Ohio, has recently published its booklet No. 309 of 16 pages, which describes and illustrates the complete line of Brownhoist gasoline and Diesel locomotive cranes. The booklet also contains data pertaining to the capacities and dimensions of the various cranes.

The "Caterpillar" for Railroads.—The Caterpillar Tractor Company, Peoria, Ill., has recently issued a folder bearing this title which is devoted principally to a pictorial description of the ditching work that was recently carried out on the Peoria & Pekin Union, using Caterpillar tractors in conjunc-

tion with ditching and grading equipment.

Steel Sheets.—The Inland Steel Company, Chicago, has published two folders describing products manufactured by that company. One of these describes a new coated sheet steel, which is designed to take paint finishes better. The other folder contains information on Inland copper-alloy steel sheets which are designed to resist rust and corrosion.

Gas Plus Air.—The Bucyrus-Erie Company, South Milwaukee, Wis., has issued a 16-page booklet, illustrated in colors, which outlines a comparison of the single-engine, clutch-equipped shovel with one in which the functions of hoisting, crowding and swinging are each actuated by an independent compressed-air engine, the compressed air being supplied by a gasoline engine-air compressor plant.

What Portables Do.—The Ingersoll-Rand Company, New York City, has issued an attractive, highly-illustrated catalogue of 32 pages with the foregoing title, showing its various models of air compressors and pneumatic tools in use in recent construction and maintenance work. The catalogue also includes essential details of the Ingersoll-Rand Type-20, portable gasoline-engine-driven compressors.

Core Drilling.—The Sullivan Machinery Company, Chicago, has recently issued three booklets bearing on the subject of core drilling. Bulletin No. 85-M contains eight pages and describes the Sullivan Type 50 core drill, while Bulletin No. 85-L has four pages and describes the Sullivan Type 10 diamond core drill. Bulletin No. 139 describes the facilities of the Sullivan Machinery Company for doing core drilling on a contract basis. This bulletin contains 12 pages.

Little Giant Electric Tools.—The Chicago Pneumatic Tool Company, New York, has issued a 70-page catalogue in which is described and illustrated, with specifications, its complete line of Little Giant electric tools. The principal tools presented in the new catalogue, which is designated No. 898, include drills, reamers, screw drivers, nut runners, tappers, grinders, screw spike drivers and track and bonding drills. These tools are designed for operation by universal, alternating and direct current.

Pusher Cars, Trailers and Motor-Car Windshields.—Fairmont Railway Motors, Inc., Fairmont, Minn., has recently issued Bulletins No. 209C and 255A, entitled Push Cars and Trailers and Windshields, respectively. The first of these bulletins, containing 16 pages, deals with the line of push cars and trailers which are manufactured by this company, listing the dimensions, the special features of design and construction and the accessories of the various models. The second bulletin, containing four pages, describes the windshields which are furnished for the various types of Fairmont motor cars.

Personal Mention

General

Ralph C. Miller, acting assistant chief engineer of the Pennsylvania, with headquarters at Philadelphia, Pa., has been promoted to general superintendent of the Southwestern division, with headquarters at Indianapolis, Ind. He was born on December 11, 1878, at Zanesville, Ohio, and graduated from Ohio State University in 1901, with a degree in civil engineering. On May 30, of the same year, he commenced his railway career as an assistant on the engineer corps of the Pennsylvania and

Ralph C. Miller

has remained with that road continuously. Mr. Miller was promoted to assistant division engineer in 1906, and while holding this position he served successively on the Marietta, Logansport and Columbus divisions. In 1913, he was further promoted to division engineer of the Toledo division and later he served in this capacity on the St. Louis, Chicago Terminal, Philadelphia and New York divisions. In April, 1926, he was transferred to the operating department as superintendent of the Schuylkill division, later being transferred successively to the Toledo and Columbus divisions. In December, 1929, Mr. Miller returned to the engineering department as acting assistant chief engineer at Philadelphia, which position he held until his recent promotion.

C. A. Johnston, whose promotion to superintendent of the Detroit division of the Wabash, with headquarters at Montpelier, Ohio, was noted in the November issue, was born on September 1, 1895, at Logansport, Ind., and was educated at Purdue University and the University of Arizona. He entered railway service on June 12, 1917, with the engineering department of the Pennsylvania, where he served as an instrumentman and an assistant on the engineer corps of the Louisville division, with headquarters at Louisville, Ky., until February 1, 1920, later serving as an assistant on the engineer corps of the Indianapolis division at Indianapolis, Ind., and on the St. Louis division at Terre Haute, Ind. Mr. Johnston was appointed an assistant engineer on the Decatur division of the Wabash with headquarters at Decatur, Ill., on May 17, 1924, and on August 1, 1926, he was promoted to resident engineer in charge of second track construction at Adrian, Mich. On August 1, 1927, he was appointed track supervisor on the Chicago Terminal division, and in April, 1929, he was promoted to division engineer of the Detroit division, with headquarters at Montpelier, Ohio, which position he held until his recent promotion.

Engineering

L. C. Sprague has been appointed consulting engineer of the Wichita Northwestern, with headquarters at New York.

J. S. Pole, assistant engineer track elevation of the Chicago & North Western, with headquarters at Chicago, resigned on November 1.

C. J. Swane, division engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Lewistown, Mont., has been transferred to Milwaukee, Wis., with jurisdiction over the Milwaukee division, which now includes the Chicago & Milwaukee, the Northern and the Racine & Southwestern divisions.

On November 1, **J. A. Parant,** principal assistant engineer on the Boston & Maine, with headquarters at Boston, Mass., left the United States under a two months' leave of absence to act in a consulting capacity on engineering and maintenance matters for the Cuban railways. Mr. Parant's headquarters are at Camaguey, Cuba.

C. T. Dike, engineer maintenance of the Chicago & Northwestern, with headquarters at Chicago, has been promoted to chief engineer succeeding **Walter J. Towne,** whose death is noted elsewhere in these columns. **J. A. Peabody,** signal engineer, with headquarters at Chicago has been appointed engineer maintenance to succeed Mr. Dike.

H. G. Holloway, assistant engineer on the Wabash, with headquarters at Springfield, Ill., has been promoted to division engineer of the Detroit and the Detroit Terminal divisions, with headquarters at Montpelier, Ohio, succeeding **C. A. Johnston,** whose promotion to superintendent was noted in the November issue and a sketch of whom appears elsewhere in these columns.

Coincident with the consolidation of the Monongah and Charleston divisions of the Baltimore & Ohio into one division under the name of the Monongah division, **J. Edwards, Jr.,** division engineer at Grafton, W. Va., has been appointed division engineer of the new division, with the same headquarters,

and **C. E. Newhouse,** division engineer at Weston, W. Va., has been appointed assistant division engineer, with the same headquarters.

A. W. White, assistant division engineer of the Ashland division of the Chesapeake & Ohio, with headquarters at Ashland, Ky., has been promoted to division engineer, with headquarters at Richmond, Va. **Garrett B. Wall, Jr.,** assistant engineer on the Ashland division, with headquarters at Ashland, has been promoted to assistant division engineer, with the same headquarters, to succeed Mr. White.

Mr. Wall was born at Richmond, on September 17, 1903, and graduated from Princeton University in 1925. He entered railroad service with the Chesapeake & Ohio as a draftsman in the office of the chief engineer on January 16, 1926, and on June 1, 1927, was promoted to the position of assistant engineer in the real estate department. On November 1, 1927, he was appointed assistant engineer in the maintenance of way department, which position he was holding at the time of his recent promotion.

Mr. White began his railroad career with the Baltimore & Ohio in September, 1910, as a rodman in the department of surveys, and in February, 1911, was transferred as a draftsman to survey and construction work on the Sandy Valley & Elkhorn Railway in the eastern Kentucky coal fields. In December, 1913, he was made supervisor on this road. After the purchase of the Millers Creek Railroad by the B. & O., and the construction of the Long Fork Railroad in April, 1920, Mr. White was made engineer in charge of maintenance of the three properties, which were known as the Kentucky district of the Baltimore & Ohio. In 1925, when the transfer of these properties to the Chesapeake & Ohio was completed, he was appointed assistant division engineer on the Ashland division, retaining this position until his recent promotion to division engineer on the Richmond division.

Track

W. H. Perrigo, roadmaster on the Gulf, Colorado & Santa Fe, with headquarters at Gainesville, Tex., has moved his headquarters to Ardmore, Okla.

T. Edmundson, acting roadmaster on the Kenora division of the Canadian Pacific, has been promoted to roadmaster on the Lethbridge division, with headquarters at Aldersyde, Alta.

James Thompson has been appointed roadmaster on the Union Pacific, with headquarters at Rock Springs, Wyo., succeeding **K. P. Williamson**, whose death was noted in the November issue.

Jack Stewart has been appointed roadmaster on the Shasta division of the Southern Pacific, with headquarters at Alturas, Cal., to succeed **T. L. Williamson,** who has been assigned to other duties.

Bill Childress, extra gang foreman on the Baltimore & Ohio, has been promoted to assistant supervisor of track, with headquarters at Lodi, Ohio, succeeding **H. J. McAllister,** who has been assigned to other duties.

Roy A. Puckett, system supervisor of maintenance of way material reports of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been appointed supervisor of maintenance of way material accounting, with headquarters at Huntington, W. Va.

L. V. Cole, assistant supervisor of track on the New York Central, with headquarters at Sandusky, Ohio, has been transferred to Alliance, Ohio, succeeding **C. W. Thornton,** who has been promoted to supervisor of track, with headquarters at Franklin, Pa. Mr. Thornton replaces **C. E. Maloney,** who has been transferred to Ashtabula, Ohio, where he succeeds **T. Ryan,** who has been transferred to Elkhart, Ind. Mr. Ryan takes the place left vacant by **C. E. Nelson,** who has been assigned to other duties.

Andrew Lahey, former assistant track supervisor on the Portland division of the Boston & Maine, who has been acting as track supervisor on the Fitchburg division in connection with extensive ballasting work on that division, has been promoted to track supervisor on the Portland division, with headquarters at Dover, N. H. In connection with certain changes in headquarters on the Portland division, **A. E. Cluff,** supervisor, District 4, has been moved from Dover, N. H., to Portsmouth; **M. E. Leavitt,** assistant supervisor, District 2, has been moved from Portsmouth to Lawrence, Mass.; and **H. C. Chaney,** assistant supervisor, District 1, has been moved from Rochester, N. H., to Nashua.

A. R. Mahaney, assistant on the engineer corps of the Baltimore division of the Pennsylvania, with headquarters at Baltimore, Md., has been promoted to assistant supervisor on the Philadelphia division, with headquarters at Columbia, Pa., succeeding **F. D. Pitts,** who has been transferred to the Middle division, with headquarters at Altoona, Pa. Mr. Pitts succeeds **H. F. Gette,** who has been transferred to Lewistown, on the same division to replace **C. E. Backus,** who has been transferred to the Maryland division, with headquarters at Wilmington, Del. **J. A. Otto,** supervisor on special duty on the Middle division, has been transferred to the Elmira division, with headquarters at Elmira, N. Y., succeeding **J. A. Schwab,** who has been transferred to the Williamsport division, with headquarters at Williamsport, Pa. Mr. Schwab replaces **E. H. Armsby,** who has been assigned to special duty on the same division. **R. P. Bell,** assistant on the engineer corps of the Cumberland Valley division, with headquarters at Chambersburg, Pa., has been promoted to assistant supervisor at Osceola Mills, Pa.

E. L. McDonald has been appointed roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Parker, Ariz., succeeding **J. A. Welch,** who has been transferred to Needles, Ariz. Mr. Welch replaces **H. L. Hoskins,** who has been transferred to Barstow, Cal., relieving **B. F. Gauldin,** who has been transferred to Oceanside, Cal.

Mr. McDonald was born on August 24, 1890, at Riverside, Cal., and after completing two years at the California Institute of Technology, entered the service of the Coast Lines of the Atchison, Topeka & Santa Fe in November, 1916, as a draftsman and transitman on construction. From October, 1917, to September 1918, he served as a transitman on the San Bernardino division, and from the latter date until January, 1919, he was in the United States Army. On this date he returned to the Santa Fe as a draftsman at San Bernardino, Cal., and in about eight months he was transferred to the Valley and Albuquerque divisions. In January, 1922, he was appointed assistant engineer on the construction of a second track between Yampai, Ariz., and Griffith, being in June, 1923, transferred to the construction of the Santa Fe, San Pedro & Los Angeles Harbor. In July, 1924, he was appointed construction roadmaster on the construction of second track, and in March, 1925, he returned to the Valley and Los Angeles divisions as a transitman. In February, 1927, he was again appointed assistant engineer, this time on the construction of second track between Defiance, N. M., and Chambers, Ariz. In August, 1927, he was transferred to the Valley division on the construction of bascule bridges, where he remained until his recent promotion, effective November 1.

Bridge and Building

Arthur B. Stone has been appointed bridge engineer of the Norfolk & Western, with headquarters at Roanoke, Va., succeeding **L. L. Kelly,** whose death is reported elsewhere in these columns. Mr. Stone was born on August 21, 1890, at Roanoke, and previous to entering railroad work, was employed as a draftsman for various industrial companies. He began his railroad career with the Norfolk & Western in July, 1912, as a draftsman, and subsequently served as designer of steel and concrete structures on that road. He was promoted to chief structural draftsman in February, 1929, the position he was holding at the time of his recent promotion to bridge engineer.

Obituary

Samual G. Henry, chief material inspector on the Central Railroad of New Jersey, with headquarters at Jersey City, N. J., died at his home in Allentown, Pa., on November 13.

S. H. Deacon, retired master carpenter of the Cincinnati division of the Pennsylvania, died at his home in Xenia, Ohio, on November 2, from a heart attack. He was 84 years of age.

W. Turner, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Arkansas City, Kan., was

killed on October 6 when the inspection car on which he was riding was derailed.

J. G. Kane, who retired in 1929 as supervisor of bridges and buildings on the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., died in that city on October 28, at the age of 73 years.

Thomas J. Milner, who in 1884 was engineer in charge of the design and construction of the Georgetown loop near Georgetown, Colo., on the Georgetown, Breckenridge & Leadville (now part of the Colorado & Southern) died at Portland, Ore., on November 7. Mr. Milner, who was 81 years of age at the time of his death, first engaged in railway engineering in Colorado about 1870. Later in his career he was chief engineer of a number of short lines in the west, including the Colombia & Puget Sound (now the Pacific Coast Railway) and the Denver & Intermountain. He was also engaged in surveys for the Moffat tunnel.

Eugene Cahill, general foreman of bridges and buildings of the Scranton division of the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa., who died on October 1, at his home at Scranton, was born on January 10, 1869, at Brackney, Pa., He commenced his railway career on July 18, 1889, as a carpenter helper on the D. L. & W. and remained with that road continuously until his death. He was promoted to gang foreman in 1900, and in 1903 he was advanced to general foreman (supervisor) of bridges and buildings, with headquarters at Binghamton, N. Y. In March, 1913, he was transferred to the Scranton division, with headquarters at Scranton, Pa., where he was stationed at the time of his death.

L. L. Kelly, bridge engineer on the Norfolk & Western, with headquarters at Roanoke, Va., died on October 29, as a result of a heart attack. Mr. Kelly was born at Saltville, Va., in April, 1883, and received his higher education at the Virginia Polytechnic Institute, from which he graduated in 1904. He entered railroad service with the Norfolk & Western in October, 1905, as a draftsman in the office of the bridge engineer at Roanoke. In September, 1912, he was sent to Norfolk, Va., as resident engineer in connection with the construction of a large coal pier at Lambert Point, Va. In October, 1916, he was promoted to assistant engineer at Norfolk, and in February, 1923, he returned to Roanoke as acting bridge engineer. Mr. Kelly was appointed bridge engineer in January, 1924, and was holding this position at the time of his death.

A. W. Thompson, an engineer by training and experience and at one time chief engineer of the Baltimore & Ohio, died at Pittsburgh, Pa., on November 9, at the age of 55 years. He was born on May 8, 1875, at Erie, Pa., and was educated at Allegheny College, Meadville, Pa., from which he graduated with a degree in civil engineering in 1897. Mr. Thompson commenced his railway career while attending school by serving with the Pittsburgh, Bessemer & Lake Erie as a rodman on location work during the summer vacation periods. Shortly after leaving school, he served for a few months as an instrumentman on the Pittsburgh & Lake Erie, then going with the Baltimore & Ohio as chief of a party on surveys. In 1900, he was appointed assistant division engineer at Pittsburgh, Pa., and a year later, he was promoted to division engineer at Cumberland, Md. In 1902, he returned to Pittsburgh as division engineer and in 1903 he went back to Cumberland as superintendent, being transferred to Wheeling, W. Va., in 1904. In 1907, Mr. Thompson was promoted to chief engineer of maintenance of way of the B. & O. and in 1910 he was further advanced to chief engineer, being appointed general manager eight months later. From 1912 until 1918, he served successively as third vice-president in charge of operation, vice-president in charge of traffic and commercial development, and vice-president in charge of operation, traffic, engineering and commercial development. On June 1, 1918, he was appointed federal manager of a group of eastern roads which included the B. & O. (Eastern lines) and the Western Maryland. In 1919, Mr. Thompson left railway service to enter the public utility field, serving successively until January, 1929, as president of the Philadelphia Company and as president of the United Gas Improvement Company. Since that time he has been a consulting engineer with offices in Philadelphia, Pa.

A. W. Thompson

M. A. Box, formerly general roadmaster on the Kansas City Southern, who died on August 31, was born on September 14, 1871, at Camden, Ark. He commenced his railway career in October, 1896, as a trackman on the Kansas City Southern, being promoted to track foreman two years later. He served in this capacity and as an extra gang foreman until October, 1905, when he was promoted to roadmaster at Spiro, Okla. On January 1, 1911, Mr. Box was promoted to general roadmaster, with headquarters at Texarkana, Tex., being transferred to Pittsburg, Kan., on June 5, 1912. In 1916, following the abolition of the position of general roadmaster, Mr. Box was appointed roadmaster at Neosho, Mo., where he remained until early in 1929, when he obtained a leave of absence because of ill health. He was unable to resume service again and his death occurred at Neosho after an illness of about a year's duration.

Walter J. Towne, chief engineer of the Chicago & North Western, with headquarters at Chicago, died at his home in Oak Park, Ill., on November 23, from pneumonia. Mr. Towne, who was 63 years of age, had served in the operating and engineering departments of the North Western for 31 years. He was born on November 28, 1867, at Leavenworth, Kan., and commenced his railway career in 1886 as a rodman on the Atchison, Topeka & Santa Fe, where he served successively as instrumentman and assistant engineer until 1891. On that date he left the service of the Santa Fe to enter Rensselaer Polytechnic Institute, from which he graduated in 1895. From 1896 until 1899, Mr. Towne served as assistant engineer on the New York State Canals, returning to railway service on the later date as an assistant engineer on construction on the C. & N. W. at Boone, Iowa. From 1900 until 1902, he served successively as assistant engineer at Kaukauna, Wis., and Escanaba, Mich., being on the latter date promoted to division engineer at Baraboo, Wis. Later he was transferred successively to Escanaba and Chicago and in July, 1906, after serving for several months as engineer permanent improvements, he was promoted to engineer maintenance of way. In April, 1912, Mr. Towne was further promoted to general superintendent, with headquarters at Chicago, which position he held until May, 1914, when he was made assistant general manager, with the same headquarters. From March to May, 1920, Mr. Towne served as engineer of maintenance and on the latter date he was promoted to chief engineer, which position he retained until his death.

Walter J. Towne

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Carnegie Steel Co.
Jennison-Wright Co.
Massey Concrete Products Corp.
Southern Wood Preserving Co.

Pipe Carriers
Massey Concrete Products Corp.

Pipe, Cast Iron
Central Foundry Co.
U. S. Cast Iron Pipe & Foundry Co.
Massey Concrete Products Corp.

Pipe, Corrugated
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Pipe, Iron Alloy
Naylor Pipe Co.

Pipe, Sewer
Armco Culvert Mfrs. Assn.
Central Foundry Co.
Massey Concrete Products Corp.
Naylor Pipe Co.
Toncan Culvert Mfrs. Assn.

Pipe, Spiral Weld
Naylor Pipe Co.

Pipe, Steel
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Ingersoll-Rand Co.
Layne & Bowler, Inc.
Sullivan Machinery Co.

Push Cars
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.

Push Car Bearings
Timken Roller Bearing Co.

Rail Anchors
American Fork & Hoe Co.
Bethlehem Steel Co.
Lundie Engineering Corp.
P. & M. Co.
Verona Tool Works
Woodings Forge & Tool Co.

Rail Benders
American Chain Co., Inc.
Buda Co.
Q. & C. Co.
Verona Tool Works

Rail Bonds
American Steel & Wire Co.
Verona Tool Works

Rail Braces
Bethlehem Steel Co.
Buda Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr., & Co., Wm.

Rail Expanders
Ramapo Ajax Corp.

Rail Layers
Buckeye Traction Ditcher Co.
Cullen-Friestedt Co.
Maintenance Equipment Co.
Nordberg Mfg. Co.

Rail Saws, Portable
Industrial Brownhoist Corp.
Kalamazoo Railway Supply Co.

Rail Shims
American Fork & Hoe Co.

Rail Springs
Verona Tool Works

Rail Tester
Sperry Products, Inc.

Rails, Girder
Bethlehem Steel Co.

Rails, Headfree
Thomson Rail Corp.

Rails, Reconditioning
Morrison Railway Supply Corp.

Rails, Tee
Bethlehem Steel Co.
Carnegie Steel Co.

Replacers, Car & Locomotive
American Chain Co., Inc.
Buda Co.

Retaining Walls, Precast
Federal Cement Tile Co.
Massey Concrete Products Corp.

Rivets
Bethlehem Steel Co.

Rock Hammers
Ingersoll-Rand Company

Rods, Welding
Oxweld Railroad Service Co.

Roof Slabs
Federal Cement Tile Co.
Massey Concrete Products Corp.

Roofing, Cement & Concrete Tile
Federal Cement Tile Co.

Roofing Composition
Barber Asphalt Co.

Rules
Lufkin Rule Co.

Rust Preventive
Dearborn Chemical Co.

Saw Rigs
American Saw Mill Machinery Co.
Fairbanks, Morse & Co.

Saws, Electric
Reed-Prentice Corp.

Saws, High Speed Friction
American Saw Mill Machinery Co.

Saw Mills
American Saw Mill Machinery Co.

Saws, Portable, Rail
Q. & C. Co.

Saws, Timber
Reed-Prentice Corp.

Scales, Tape
Lufkin Rule Co.

Scales, Track
Fairbanks, Morse & Co.

Screw Spikes
Bethlehem Steel Co.
Illinois Steel Company

Screw Spike Drivers
Chicago Pneumatic Tool Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

Sharpeners, Rock Drill Steel
Ingersoll-Rand Co.

Sheathing Paper
Barber Asphalt Co.

Sheet Iron
Armco Culvert Mfrs. Assn.

Shingles, Composition
Barber Asphalt Co.

Shovels
Verona Tool Works
Woodings Forge & Tool Co.

Signals, Bridge & Warning
Hastings Signal & Equipment Co.

Siphons
Armco Culvert Mfrs. Assn.

Skid Excavators & Dredges
Northwest Engineering Co.

Skid Shoes
Q. & C. Co.

Slabs, Concrete
Massey Concrete Products Corp.

Smokestacks
Chicago Bridge & Iron Works
Massey Concrete Products Corp.

Snow Melting Device
Cook Co., Howard P.
Lundie Engineering Corp.
Q. & C. Co.
Ruby Railway Equipment Co.

Snow Plows
Jordan Co., O. F.
Q. & C. Co.

Spike Pullers
Independent Pneumatic Tool Co.

Spikes
Bethlehem Steel Co.
Illinois Steel Co.

Standpipes
Chicago Bridge & Iron Works
Fairbanks, Morse & Co.

Stands, Switch & Target
Bethlehem Steel Co.
Ramapo Ajax Corp.
Q. & C. Co.

Steam Enclosures
Toncan Culvert Mfrs. Assn.

Steam Shovels
Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Orton Crane & Shovel Co.

Steel, Alloy
Bethlehem Steel Co.
Central Alloy Steel Corp.
Illinois Steel Company

Steel Cross Ties
Bethlehem Steel Co.
Carnegie Steel Co.

Steel, Electric Furnace
Bethlehem Steel Co.
Timken Roller Bearing Co.

Steel Frame Houses
Butler Mfg. Co.

Steel, Open Hearth
Bethlehem Steel Co.
Carnegie Steel Co.
Timken Roller Bearing Co.

Steel Plates and Shapes
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Steel, Special Analysis
Bethlehem Steel Co.
Timken Roller Bearing Co.

Storage Tanks
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.

Storm Sewers, Corrugated Iron
Armco Culvert Mfrs. Assn.

Stream Enclosures, Corrugated Iron
Armco Culvert Mfrs. Assn.

Street Culverts, Part Circle
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Structural Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Switch Guard
Ramapo Ajax Corp.

Switchmen's Houses
Massey Concrete Products Corp.

Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switchpoint Protectors
Fleming Co.
Maintenance Equipment Co.

Switchpoint, Reconditioning
Morrison Railway Supply Corp.

Switchstands & Fixtures
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Tampers, Tie
See Tie Tampers

Tanks & Fixtures
Fairbanks, Morse & Co.

Tanks, Fire Protection
Chicago Bridge & Iron Works

Tanks, Oil Storage
Chicago Bridge & Iron Works

Tanks, Roadside Delivery
Chicago Bridge & Iron Works

Tanks, Steel
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.

Tapes, Measuring
Lufkin Rule Co.

Telegraph Service, Long Distance
American Telephone & Telegraph Co.

Telephone Service, Long Distance
American Telephone & Telegraph Co.

Telltales
Hastings Signal & Equipment Co.

Testers, Rail
Sperry Products, Inc.

Testing of Materials
Hunt Co., Robert W.

Thawing Outfits
Cook Co., Howard P.
Lundie Engineering Corp.
Q. & C. Co.
Ruby Railway Equipment Co.

Ties
Jennison-Wright Co.
Southern Wood Preserving Co.

Tie Plate Clamps
Q. & C. Co.

Tie Plates
Bethlehem Steel Co.
Illinois Steel Co.
Lundie Engineering Corp.

Tie Rods
Bethlehem Steel Co.

Tie Scorer
Woolery Machine Co.

Tie Spacers
American Chain Co., Inc.
Maintenance Equipment Co.

Tie Tampers
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Electric Tamper & Equip. Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.
Syntron Co.

Tile, Roofing
Federal Cement Tile Co.

Timber, Creosoted
Jennison-Wright Co.
Southern Wood Preserving Co.

Tools, Pneumatic
Chicago Pneumatic Tool Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

Tools, Track
Buda Co.
Maintenance Equipment Co.
Q. & C. Co.
Verona Tool Works
Woodings Forge & Tool Co.

Tongue Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.

Track Bolt Wrench
Independent Pneumatic Tool Co.

Track Cranes
Buckeye Traction Ditcher Co.
Cullen-Friestedt Co.
Nordberg Mfg. Co.

Track Gages
Buda Co.
Kalamazoo Railway Supply Co.
Verona Tool Works

Track Insulation
Q. & C. Co.

Track Levels
Kalamazoo Railway Supply Co.

Track, Special Work
Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.

Trestle Slabs
Massey Concrete Products Corp.

Trench Excavators, Pipe Line, Chain-and-Bucket Type, Wheel Type
Buckeye Traction Ditcher Co.
Industrial Brownhoist Corp.

Trucks, Hand Steel
Anchor Post Fence Co.

Tubing, Seamless Steel
Timken Roller Bearing Co.

Tunnel Warnings
Hastings Signal & Equipment Co.

Undercrossings, Corrugated Iron
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Ventilators
Q. & C. Co.

Warning Devices, Bridge & Tunnel
Hastings Signal & Equipment Co.

Water Columns
Fairbanks, Morse & Co.

Water Cranes
Fairbanks, Morse & Co.

Water Supply Contractors
Layne & Bowler, Inc.

Water Tanks
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.

Water Treating Tanks
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.

Waterproofing Fabrics
Barber Asphalt Co.

Weed Burner
Fairmont Railway Motors, Inc.
Woolery Machine Co.

Weed Killer
Chipman Chemical Engineering Co., Inc.
Q. & C. Co.

Welding and Cutting Apparatus, Acetylene
Oxweld Railroad Service Co.

Welding, Electric
Electric Railroad Sales Corp.

Welding Supplies
Oxweld Railroad Service Co.

Well Casings
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Well Systems
Layne & Bowler, Inc.

Wheels, Hand & Motor Car
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Wheels, Wrought Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Windshields
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.

Wire Fencing
American Steel & Wire Co.
Anchor Post Fence Co.
Bethlehem Steel Co.
Page Fence Association

Wire, Welding
Oxweld Railroad Service Co.

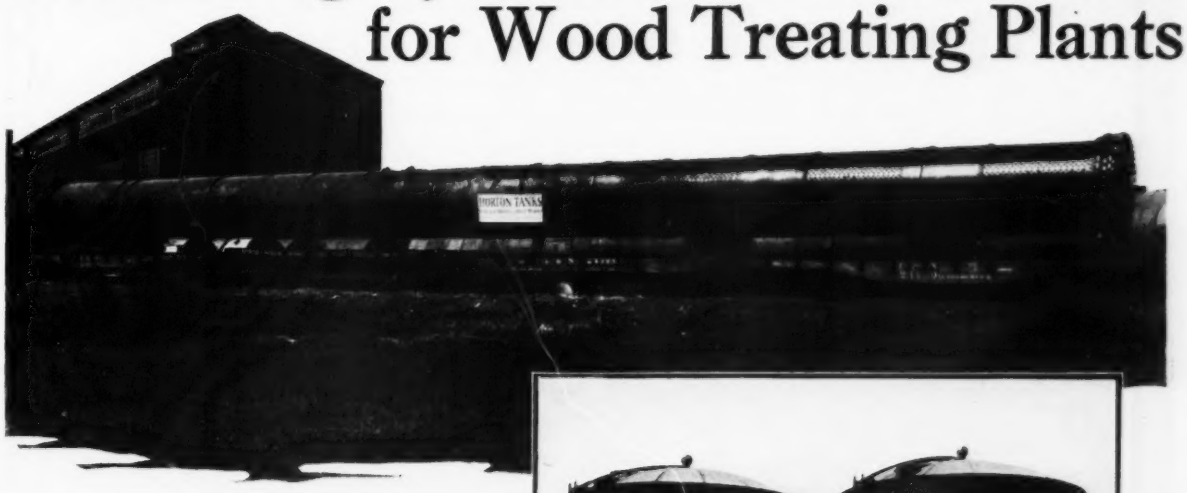
Wood Preservation
See Preservation, Timber

Wood Working Machinery
American Saw Mill Machinery Co.

Wrenches
Lowell Wrench Co.

Zinc-Meta-Arsenite Treatment
Curtin-Howe Corp.

Creosoting Cylinders and Steel Tanks for Wood Treating Plants



Get all steel plate equipment from one source

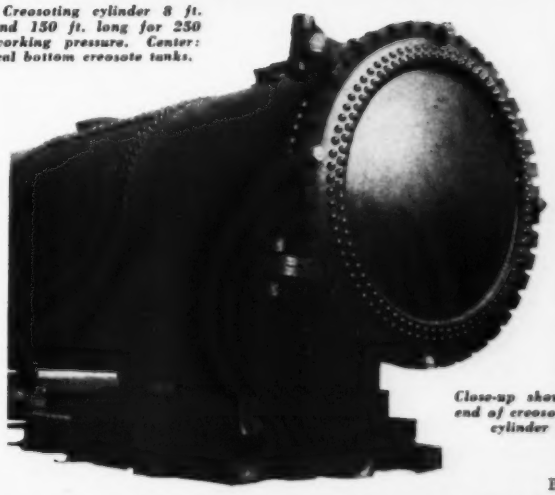
We are equipped to handle all kinds of steel plate equipment required at a wood treating plant. By securing all such equipment from one source you save detail work in all departments. One set of orders, instructions, etc., takes care of everything. One crew erects all of the work.

Creosoting cylinders are riveted-up complete at the plant, tested and shipped complete. Small tanks are also shipped completely assembled.

Flat bottom storage tanks and elevated tanks for water and other liquids are field erected. Storage tanks are built in a complete range of standard sizes from 500 barrels up, which will meet practically any storage requirement. Where it is desirable to deliver creosote by gravity, standard conical-bottom tanks are often used. Ellipsoidal-bottom tanks provide gravity water pressure for fire protection and general service.

When requesting quotations on creosoting cylinders, give diameter, length, pressure and location. On tanks, give capacity, location and height to bottom for elevated structures.

Top: Creosoting cylinder 8 ft. dia. and 150 ft. long for 250 lbs. working pressure. Center: Conical bottom creosote tanks.



Close-up showing end of creosoting cylinder

B-189

CHICAGO BRIDGE & IRON WORKS

Chicago	2452 Old Colony Bldg.
New York	3156 Hudson Terminal Bldg.
Cleveland	2202 Union Trust Bldg.
Dallas	3309 Magnolia Bldg.
Birmingham	1546 50th Street, N.
Houston	1125 Electric Bldg.
Tulsa	2401 Exchange Bank Bldg.
Detroit	1519 Lafayette Bldg.
Philadelphia	1609 Jefferson Bldg.
Atlanta	2136 Rhodes-Haverty Bldg.
San Francisco	1007 Rialto Bldg.
Boston	1522 Consolidated Gas Bldg.
Seattle	4313 Smith Tower
Havana, Cuba	Apartado 2507

HORTON TANKS

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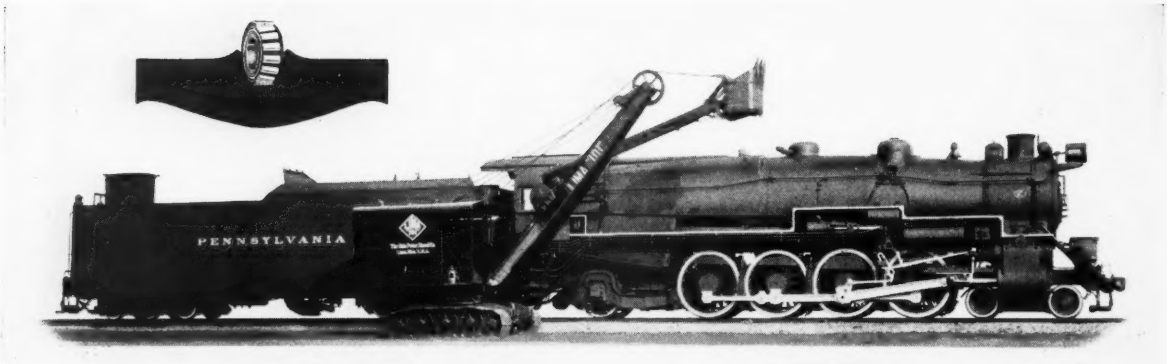

Both Lima—
Both Timken Bearing Equipped

The Ohio Power Shovel Company, Lima, Ohio, builders of the Lima "101", have equipped their shovels with Timken Bearings at all vital points for years.

They adopted Timkens because their long experience and analytical engineering judgment told them that the exclusive combination of Timken tapered construction, Timken positively aligned rolls and Timken-made steel, embodies anti-friction advantages which no other bearing can offer.

For in Lima shovels, as in modern machinery of all types, it is not only a question of eliminating friction, but of carrying radial, thrust and resultant loads, of holding shafts in alignment, of protecting gears, of resisting shock and torque.

Their judgment has been endorsed over and over again by users of their equipment since the first Timken-equipped Lima shovel was built; but recently, through their associate organization, The Lima Locomotive Works, they received a different although equally convincing endorsement when the Pennsylvania Railroad Company ordered twenty-five Lima locomotives with Timken Bearing Equipped tenders. These locomotives are now in service. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**